PLEASE RETURN

SECTION V

PUBLIC TELEVISION REPORT

by

MONTANA TELECOMMUNICATIONS PROJECT

June 1981

INTRODUCTORY NOTE

Due to constraints of time, funding and space it is not possible to describe each mix of technical alternatives that could be used to deliver radio and TV signals to Montana, in whole or in part. It is even more difficult to devise approximate current cost estimates for such systems. In point of fact, costs vary for many reasons and change constantly in response to increased competition, explosive technology, growing markets, and new applications. In some cases, costs for equipment - and the kinds of equipment available - cited in the following report, change significantly on a monthly (or sometimes weekly) basis. This report, therefore, is intended as nothing more than a guide to those who may consider public radio and TV in the future.

The reader and general public should understand that not only will the costs for technical alternatives change, but that the different technical means of distributing signals involve major economic and political issues which may generate considerable disagreement. For example, whether public radio and TV in Montana should have Montana originated programming at the state or local level, or both, can result in a good deal of debate. The technical means of providing any kind of public radio and TV can cause similar debate among professionals and interest groups pursuing one point of view or another.

This report raises but makes no attempt to answer the policy questions which must be determined prior to systems design and implementation of public TV or radio in Montana. Such policy decisions - including whether to have publicly funded radio and TV - are far beyond the appropriate function of the Telecommunications Project.

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SECTION V

PUBLIC TELEVISION

BACKGROUND

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The State of Montana is comprised of 147,138 square miles and has a population of 786,690, according to the 1980 census. The resulting population density - 5.35 persons per square mile - make Montana one of the least densely populated states in the country. Such statistics alone, however, do not adequately reflect the immensity of Montana's size or, more specifically, the quantum mechanics necessary to any communications system which permits communication to, or between, its people.

At its greatest, Montana is approximately 555 miles long and 325 miles deep. The state's nine major population centers (Billings, Bozeman, Butte, Great Falls, Havre, Helena, Kalispell, Miles City, and Missoula) have a combined population of 270,840, which comprises 34.4% of the total population. The counties within which those cities are located encompass a combined population of 471,803, or 60% of the total population. Since the population patterns generally represent a concentrated scattergram (like a full choke shotgun pattern), something less than 60%, probably about 50%, of all Montanans reside in those areas. Which is to say that roughly 50% of Montana's citizens are scattered hither and yon with great distances between them, or between them and the major population centers.

In addition to the quantum mechanics inherent to any communications system tying all Montanans together, quantum economics are also involved. Both observations hold true for public television (PTV).

te PTV

Montana is one of two states (Wyoming is the other) which do not have PTV broadcast stations that insert local programming in addition to broadcasting Public Broadcasting Service (PBS)* programs. That is not to say many Montanans do not receive PBS. Many do, and more could - if they wished to pay cable TV companies for the service. The PBS stations carried to Montana viewers by Cable TV (CATV) companies or other means are out-of-state. Thus, the "local" programming carried by those stations are local to the surrounding states within which the station is located, not to Montana. Also, from the geographical perspective, the vast majority of Montana's land area is unserved by any form of public television.

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In 1974, the 43rd session of the Montana Legislature created the Educational Broadcast Commission. The Commission consisted of the Superintendent of Public Instruction, the Commissioner of Higher Education, the Director of the Department of Administration (or their designees), and five citizens appointed by the Governor from lists provided by the Board of Public Education and the Board of Regents.

The Commission was charged with promoting, establishing and maintaining facilities to provide non-commercial educational programs for the benefit of both education and the public. In pursuit of those goals, the Commission was granted authority to acquire property, seek additional funding, construct or repair facilities, contract with common carriers (signal transmission companies) and do whatever else might be required to establish PTV. The legislature granted $300,000 to establish the Commission.

* Unless otherwise indicated, Public Television (PTV) and the Public Broadcasting Service (PBS) are the same in this report.

The Commission returned to the 44th Legislature in 1975 and submitted a plan to provide PTV to Montana. The plan essentially called for the establishment of a broadcast public television station in Bozeman with the ability to produce Montana programming in addition to rebroadcast of PBS programs. The broadcast signal was then to be rebroadcast around the state by a system of TV translators. (Many of Montana's commercial stations are similarly rebroadcast to areas that would not otherwise receive them). The initial funding request was for $951,948 the first year and $1,037,194 the second year ($1,989,142.00 total). In addition, the Commission received a federal HEW grant in 1974 for $577,740.00.

The 44th Legislature did not fund the Commission's continuation for a variety of reasons, which included a scandal related to conflict of interest allegations, excessive cost, political horse trading, and the absence of a commitment to PTV. An effort to continue the promotion of a Montana PTV facility by interested citizens failed also. There has been no successful attempt to bring the PTV issue before the legislature up to the time of this report.

The Public Service Satellite Consortium (PSSC) is an international, non-profit membership organization, currently composed of over 100 members from diverse public service fields, including medicine, public broadcasting, state telecommunications agencies, and education. The PSSC's purpose is to assist in the efficient delivery of services through application of new communications technologies and to have a voice at national and international forums which effect the future

development of satellite technology. The Corporation for Public Broadcasting, the Public Broadcasting Service, and National Public Radio are members of the PSSC.

In 1979 the Public Service Satellite Consortium completed a study of 17 Montana communities to determine the best technical alternatives for providing PTV, as well as the communities' desire to receive it. The study, conducted on behalf of the Corporation for Public Broadcasting, also included Wyoming and the Appalachia region of the Southeastern U.S. The Study is contained in Attachment "A" of this report.

The Montana communities included in the PSSC study were: Boulder, Broadus, Browning, Chester, Chinook, Circle, Fort Benton, Harlowton, Jordan, Philipsburg, Roundup, Ryegate, Scobey, Thompson Falls, Virginia City, Wibaux and White Sulphur Springs. In determining public attitudes toward PTV, the PSSC staff conducted interviews with "community leaders", predominately elected officials. The survey should therefore not be considered scientifically valid, insofar as the general public was not contacted.

The PSSC study arrived at some interesting conclusions worth noting, however. The practical priority of the communities surveyed was reception of a good quality PTV (PBS) signal. It was found that, "a majority of communities surveyed, however, indicated little or no interest in local origination" (Pg. 34, Attachment A). The costs of extending PTV service to unserved areas via cable or TV translator are excessive due to the low populations that would carry the financial burden; "outside" financial help would be required. Finally, the planning, development and delivery of PTV to rural America (read Montana) would require a coordinating body.

The PSSC study appears to have had no appreciable impact on either Montana or Wyoming, neither of which has created an in-state broadcast facility.

In addition to the study, the Public Service Satellite Consortium continues to provide assistance to citizen groups and communities interested in acquiring PTV. Specific reference is made to the University of Alaska Instructional Telecommunications Consortium project and the Nevada Plan; both would provide PBS to Montana communities and are discussed at some length in Part VI (Technical Alternatives) of this report.

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Regulatory control of the communications industry is long, complex, and confusing. The following is of interest:

(1) The Rural Electrification Act of 1935 was amended in 1949 to provide REA funds to rural telephone companies on the same basis as rural electric companies. In 1962 the Act was amended to specifically exclude Cable TV (CATV). In the late 1970's the National Telephone Cooperative Association proposed that the definition of telephone service be amended to include cable TV (CATV), and REA loans be made available to provide such service in rural areas. The actual result was some REA funding of rural telephone company distribution cable in areas too unprofitable for a cable company; the telephone company charged signal providers for using the cable.

(2) FCC TELCO/CATV Cross-Ownership Rule. In 1970 the Federal Communications Commission prohibited the telephone companies (TELCO) from distributing Cable TV (CATV) through an affiliated company. The FCC determined that the cross-ownership of CATV systems by telephone

companies deprived private companies of a fair and competitive environment, though good cause exceptions could be made. In 1976, the National Telephone Cooperative Association, along with other interest groups, formally asked the FCC to abolish its cross-ownership ban for rural areas. In June 1981, the FCC was considering and granting waiver requests to permit rural telephone companies to provide CATV (Cable TV) to subscribers. A final determination on the cross-ownership ban is expected by the FCC in 1981 or 1982. Industry observers expect the FCC to modify the cross-ownership ban to permit rural telephone companies to directly provide cable TV to subscribers.

(3) FCC CATV/Translator Cross-ownership Rule. The common ownership of CATV and TV translators is prohibited on grounds that CATVs would provide less than satisfactory translator service due to competitive interests. The use of cable signals to rebroadcast over low power transmitters serving rural areas without cable has been authorized since the late 1970's. For additional FCC regulations for translators, see Attachment B.

EXISTING VIDEO NETWORKS

There are three microwave common carriers operating in Montana: Western Tele-Communications, Inc.; Intermountain Microwave, Inc.; and Mountain Bell. The microwave systems for the Western and Intermountain operations are schematically represented in Attachment C. The 35 cities that could be served by Bell with video are included in list form.

Of the three common carriers, only the Bell system is regulated as to pricing; largely because its system is primarily used for long distance transmission of voice channels rather than wide band video channels.

Intermountain Microwave, Inc. provides Cable TV service through Teleprompter, a subsidiary. Teleprompter provides CATV to the High Line communities, Great Falls, and the Missoula-Hamilton-Kalispell area. Teleprompter does not carry any PTV channel. KSPS of Spokane, Wa. (a PBS station) could be provided, but Teleprompter views the technical and economic costs of doing so to be too great.

Western Microwave basically serves the I-90/I-94 corridor between Glendive and Missoula, plus Kalispell, Great Falls, and Lewistown. The schematic in Attachment C indicates 22 communities are served with CATV.

The Western Microwave system carries PBS station KUED from Salt Lake to all cable systems along its route. The PTV service is included in the basic monthly fee charged for cable service. At present there is no arrangement for inserting Montana originated programing into the KUED schedule, but that is not technically difficult.

There are 49 known CATV systems operating in Montana, according to a Telecommunications Project Study completed in June, 1981 by Charlie Bickenheuser (Attachment D - An inventory of the Cable Television Companies in Montana). All 49 cable companies have undergone major expansion, or will within one year. The majority of the CATV systems employ Western Satellite (WESTAR) reception (42%). Microwave links account for 35% of CATV feeds. By industry counts, there are 126,356 households presently reviewing cable TV, 72% of which receive PBS.

The only public TV provided by a translator is located in Libby for KSPS of Spokane, Wa.

Several private companies, most notably Montana Power and Burlington Northern Railroad, maintain microwave systems for in-house communications. Schematics are not readily available. MPC has cooperated with the State in microwave/radio site sharing in the past and will probably continue to do so. Burlington Northern's system is apparently strictly in-house.

The Telecommunications Project contracted with the Montana Institute of High Technology Application, Missoula, to assess video equipment holdings, use, and applications in state government, the university system and the private sector. The resulting report is Attachment E.

State agencies report 43 TV sets, fifty videotape recorders/players, two editing machines, 41 TV cameras (13X color), and a wide variety of accessories. The equipment is used for in-house training, documenting speakers, public service announcements, TV documentaries, and public meeting presentations. Only one agency has a full time, trained staff member to operate video equipment.

Agencies generally do not own state-of-the-art equipment, and many anticipate considerable systems replacement for the purpose of maintaining their capabilities rather than expanding them.

Centralization of video equipment and production would seem to be justified for only two purposes: (1) to maximize equipment uniformity and cost; and (2) provide occasionally needed, sophisticated production services. Equipment reflects the hodge-podge of incompatible systems offered by the industry. While there are reasons for using particular equipment incompatable with other equipment, much of the incompatability could be reduced. Also, if a central purchasing function were established, which could also lease to other agencies, equipment cost could be better controlled. With respect to central production, few agencies require sophisticated production equipment or personnel except on an accasional basis. It would therefore seem logical to centralize such production for the shared benefit of all agencies.

Greater centralization would not appear reasonable in view of agencies' day-to-day use of equipment and the willingness of agencies to share equipment with those temporarily requiring its use.

Montana's university system's video equipment is generally adequate for instructional purposes. MSU and UM possess rather extensive equipment and expertise in production. There is a problem of compatability between production equipment and formats between campuses.

Independent television producers seldom last in Montana - none are more than 5 years old, and 5 have failed in the past 10 years.

Montana's broadcast stations represent the most extensive capabilities in the private sector. Each station possesses the studio, production equipment, and personnel - in varying degrees - to produce TV features. Broadcasters, however, utilize their equipment for their own business purposes, and are not generally available as production facilities.

PUBLIC SENTIMENT

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Survey

The Telecommunications Project established task forces in several areas, including public TV, for the purpose of providing suggestions and ideas to the Montana Telecommunications Advisory Council and the Project. The Task Force was surveyed in May, 1981 on a variety of PTV issues. Half of the respondents did not receive PTV. The survey and results are contained in Attachment F. Attachment G contains the list of PTV Task Force members.

As might be expected, the response was biased almost totally in favor of PTV. The majority (80%) wanted Montana to have its own PTV system (not necessarily PBS) with production capability. "Free" PTV was definitely desired by 90%. Most wanted programming provided by the university system or an independent PBS affiliate. All thought if Montana doesn't have a PTV system that it would be important to be able to insert local programming. Costs (taxes or commercial fees) considered fair were split; 40% wanted $5 or less per month and 40% would accept what the market would bear.

The majority, 60%, thought any state expenditures should be approached with utmost caution if PTV is inevitable through other means in the next five to ten years.

In May, 1981 the Telecommunications Project conducted a scientifically valid random telephone survey of Montanans statewide for the purpose of determining public opinions on a wide variety of public television and public radio issues. The randomly selected 1,434 interviews were chosen from computer-produced telephone numbers from a random generation program based on all phone numbers in Montana.

Computer analysis of the results were done by Dr. Rita Flaningam of MSU. The survey form is contained in Attachment H. Results of the computer analysis are available at the Telecommunications Project or Dr. Flaningam (several thousand pages). The rough survey results are as follows.

N = Responsents = 1,434

1. 60% of those surveyed do not receive PBS, 38% do.
2. 23% could receive PBS if willing to pay for it.
3. 61% of Montanans do, or could, receive PBS.
4. 80% receive PBS by cable

   13% receive PBS by translator

   4% receive PBS by Direct broadcast (out of state) or translator.
5. 90% receiving PBS are satisfied with the programming.
6. 81% of those buying cable service pay $10 or less (exclusive of HBO).
7. 80% receiving PBS would like more Montana-originated programming (Mt. history and culture, 70%; local issues politics, 66%; outdoor and recreational, 71%).
8. 60% of those who could buy cable with PBS, but do not, cite excessive cost as the reason.
9. 67% of those who could buy cable with PBS, but do not, say they would if there were Montana-originated PBS programming.
10. Funding preferences for Public Television:

    (a) 28% Combined state/local TV district
    (b) 14% Private funding only
    (c) 9% Local TV district only
    (d) 9% Personal purchase of satellite reception equipment
    (e) 5% State funding only
    (f) 28% Don't know

EXPANSION PLANS FOR EXISTING VIDEO NETWORKS

The video networks, as essentially private sector operations, will expand in accordance with profit potential and traffic demand. The greatest growth has been in cable company expansion in recent years; a trend that will continue.

The expansion plans of cable companies and common carriers is viewed as competitive information. Little factual data is, therefore, available.

TECHNICAL ALTERNATIVES FOR PTV SIGNAL DISTRIBUTION

There are a variety of technical methods that could be used to provide PTV to Montana, in whole or in part. The reader will clearly discern two things. First, a mix of the technical alternatives is more likely than any one of them alone. Secondly, there are weighty policy implications inherent in a selection of any alternatives or mix of alternatives. Prominent policy questions which arise include: (1) whether or not "local" Montana programming will be possible, and to what extent; (2) what portion of the state, and the population, can be served; (3) what the impact on commercial cable systems might be; (4) what the cost might be, and how it would be distributed; and (5) whether a system, if built, would become obsolete or by-passed by new technology in the foreseeable future.

What follows is a brief description of the major technical alternatives available for distributing PTV signals coupled with a general analysis of the relative costs involved. There is no attempt

to answer the policy questions noted above. Much of the information is based on a sub-contracted study for the Project carried out by Dr. Dan March, electrical engineering consultant and MSU instructor, to be found in Attachment I.

COMMON FACTORS

Regardless of the technology used to distribute a PTV signal, there are certain common factors.

While it is possible to distribute nothing, it is less than profitable. Whatever is broadcast must first be produced by somebody somewhere. The Public Broadcasting Service (PBS) is the largest non-commercial producer and program buyer in the U.S. Consequently, most PTV stations are PBS affiliates. Programs may also be produced by PBS stations, non-profit foundations, commercial producers, universities, and a large number of independents. Independents include local citizen groups, government funded cultural groups, special interest groups, and others. PBS stations can, and frequently do, preempt PBS programming (called "feed") and insert programming produced by others or themselves.

Not all Public Television is PBS. PTV stations may be independent by buying the programming desired (seldom done because it is much more costly), by being used for educational purposes, or by mixing PBS feed with a significant percentage of non-PBS programming. The University of Alaska Instructional Telecommunications Consortium, for example, will operate a PTV system based on satellite broadcasting which will combine considerable educational programming from PBS and other sources.

Regardless of the technology employed, there must be a facility which schedules, converts programs into electronic signals to be put into the distribution system, and generally controls the technical processes of originating the signal. Such a feed control, which may be a studio, may be located at each point where a signal is received and is retransmitted; the signal may be retransmitted or preempted, for additional capital and maintenance costs.

There are three ways in which a TV signal can be received in the home: antenna, cable, satellite dish. The TV set itself doesn't know the difference since each system employs equipment to provide the same input into the set. The antenna generally costs less, the cable more, and the satellite dish is most costly at present.

BROADCAST

The feed control takes the produced programming and sends it to a high broadcast tower, which may be some distance away, by cable or microwave. Equipment at the tower powers up the signal (up to 300 KW) which becomes an "airwave" after leaving the antenna. The signal is then received either by a TV set antenna or a TV translator which may "condition" the signal and then retransmit the signal on a different frequency.

A broadcast system to cover Montana would require seven high power broadcast stations. They could operate independently or as a network linked together by microwave or satellite. In addition, a number of TV translators would be required to reach rural areas or areas hidden by terrain. A high power signal can be translated three or four times. The distance between a translator and a high power

transmitter, or between translators, is determined by line of sight. The number of translators required is unknown and would require an extensive engineering study.

TV channels are VHF (very high frequency) and UHF (ultra high frequency). As frequency goes up, the signal assumes more of the characteristics of light - line of sight. VHF signals (channels 2-13) are lower frequency and therefore "bend" around hills, whereas UHF (channels 14-69) does not. UHF is therefore not suitable for portions of Montana. There are enough channels, 2-13, available for PTV at present.

According to Dr. March, costs would be approximately:

(1) 7 stations X $1,700,000 per station =	$11,900.00
(2) 40 translators (assumed) X $18,000 =	720,000
(3) 7 stations X satellite receiving equipment X$70,000 =	490,000
(4) Production equipment	unknown
(5) Physical plant	unknown
(6) Personnel	unknown
(7) Transmission feeds (Mw)	variable
(8) Maintenance of system (10% of capital station cost)	1,190,000

MICROWAVE

Produced programs are taken by feed control and transmitted via cable or microwave to a receiver which is part of a larger microwave system. The signal is then retransmitted to the next microwave receiver/transmitter, and so on. The signal may be taken off the system at any microwave tower site. Sites that have equipment to remove or insert transmissions are drops. If the microwave tower

does not have remove/insert equipment it is a repeater used to continue a signal between those that do; but the equipment to create a drop may be added.

The microwave option is complex, not because the system is complex (it is commonplace, though sophisticated) but by virtue of the options available. Three common carriers operate systems which, alone or together could cover most of Montana (see EXISTING VIDEO NETWORKS, and Attachment C of this report). In addition, there is a fourth possible option: a state owned/leased microwave system used for land mobile, data communications, telephony, public radio, and public TV on an integrated basis.

State Owned. According to a 1973 MSU Electronics Research Laboratory Report (#3373 - Montana State Communications System), modified for todays costs and 6 GHz design characteristics necessary to a state video system serving all cities with at least 4,000 people, costs would approximate the following:

Mw equipment (53 repeaters, 12 terminals=65X$50K)	$3,250,000
Annual Maintenance	325,000
Site, Construction, power, etc.	unknown
	$3,575,000 plus unknowns

Mountain Bell. Charges for usage of Bell's Mw system to cover the same cities of over 4,000 population would be approximately as follows:

Mileage ($84.10X1,422 miles) per month	$119,590.20
Local station loops (21X$1,051) per month	22,071.00
Station connections (21X$1,577) per month	33,117.00
	$174,778.20/mo.
	X 12
	$2,097,338.40/yr.

Those figures exclude low power transmitter equipment and represent Bell's best estimates in the absence of an extensive engineering study.

Intermountain Mw and Western Mw. Montana's two private common carriers, the Intermountain and Western Mw systems, could - with remote repeaters - cover the entire state. Arrangements for doing so would be highly negotiable, however, rendering cost estimates difficult. The state could pay the cable companies to carry the PBS signal, or permit them to carry it for nothing in return for the right to remove the signal for transmission at drop and repeater sites. Removal and low power transmission of the signal would be an expense borne by the state (guestimated at $500,000 for a Bozeman originated signal by Western; costs for Intermountain are unknown).

Mr. Dell Matthis, general manager of Western Microwave, has suggested a PTV system now known as the "Matthis System". The system is explained in Attachment I, pages 41-43. Basically, Mr. Matthis proposes a Montana PTV studio that would "strip" KUED (Salt Lake PBS) feed, or take PBS feed off satellite, and provide such programming free to Western and Intermountain. The system would then expand by use of low power transmitters and TV translators; there would probably be no cost for the actual Mw transmission of the signal. However, the plan would - to widely varying degrees in terms of cost - require a studio and production facility.

It is very possible that an arrangement like the "Matthis System" would be the least expensive of the microwave distribution options.

Satellite

Satellite systems are conceptually simple. An uplink sends produced programming to the satellite in the form of a narrow microwave beam. The satellite equipment which receives the signal, called a transponder, retransmits the signal over a broad area. Earth dishes collect and concentrate the Mw signal, which is then retransmitted over a Mw system or converted from Mw freqency into the desired TV frequency and broadcast or carried by cable to viewers, or any combination thereof.

The programming which is received is either controlled or it is not. If not, programming is purchased or "stolen" from others. If controlled, the programming is produced or purchased, scheduled, and transmitted to the satellite. That is, the feed control function in the schematics is owned and operated by, in this case, the state.

Uplink

(1) Up-link w/o redundant transmitter equipment	$300,000
(2) Up-link w/redundant transmitter equipment	400,000
(3) Satellite transponder, unprotected	1,500,000
(4) Satellite transponder, protected (w/backup)	1,800,000

Receive Only Downlink

(5) Dish and electronics, per site	$35,000 each

Transmission Options

(6) Low power transmitter, per site	15,000
(7) Translators, per site	15,000
(8) Higher power transmitters, eight cities, per site	70,000

Estimates

I.	Broadcast of PTV, equipment only, for the eight cities presently with broadcast TV stations, and all other county seats (low power transmitters)	$1,680,000
II.	Uplink (transmitter and dish equipment only)	400,000
III.	Minimum Satellite transponder charge	1,500,000
	First Yr. Total	$3,580,000

Second Yr. Total $1,500,000 plus unknowns and variables noted below.

NOTE: Unknowns and Variables: studio costs - physical plant, production equipment, personnel; maintenance; site alteration/construction; power, etc.

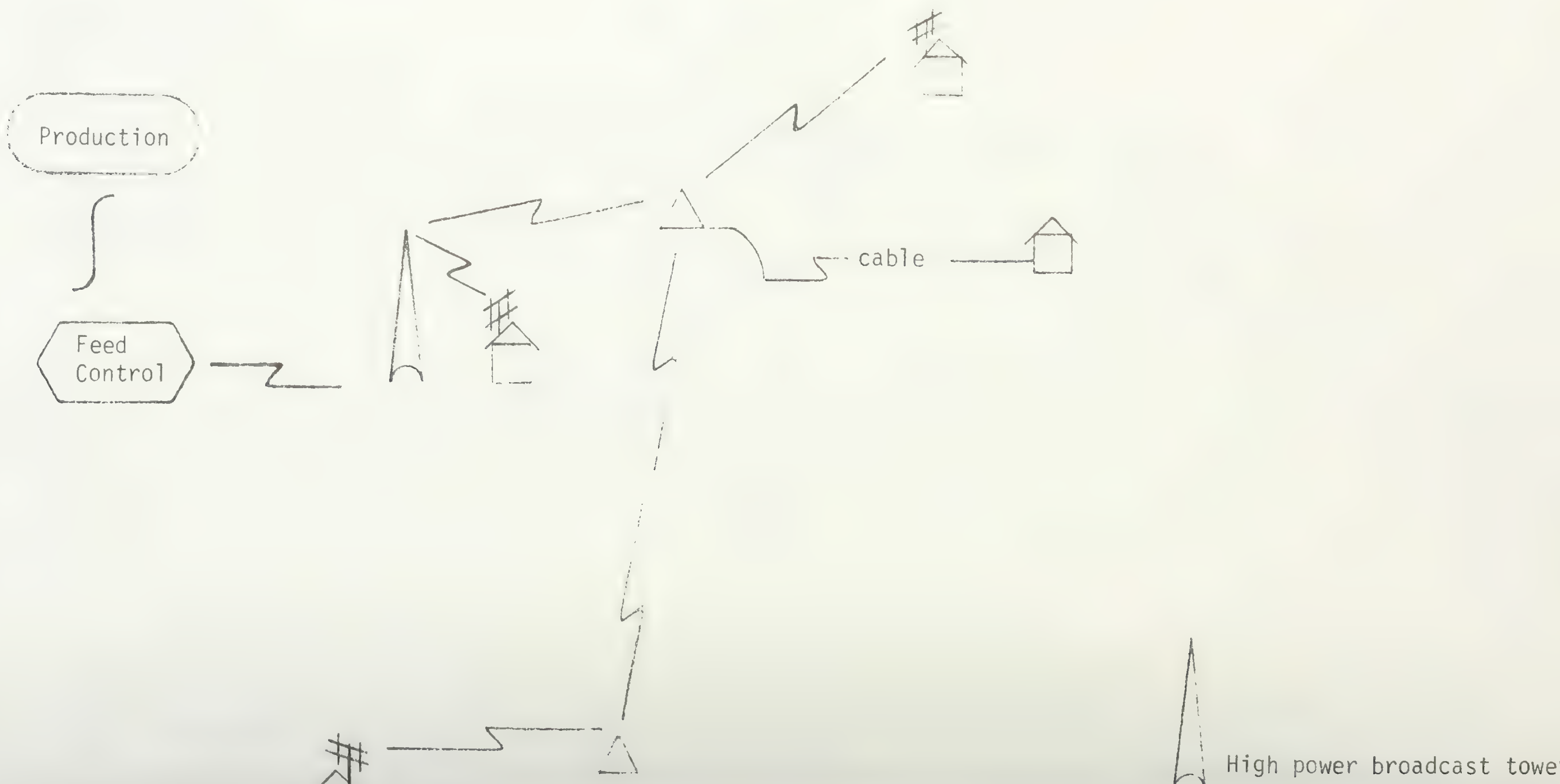
Reception and distribution of satellite programming may be decentralized, in whole or in part, from the standpoint of both operation and funding. It may also be done on a cooperative basis. Consider the following.

Alaska intends to lease a satellite transponder and mix PBS, instructional, and other programming for broadcast starting October 1, 1981. Montana can receive the satellite signal and has, in fact, received permission from Alaska to do so free of charge. See Attachment J.

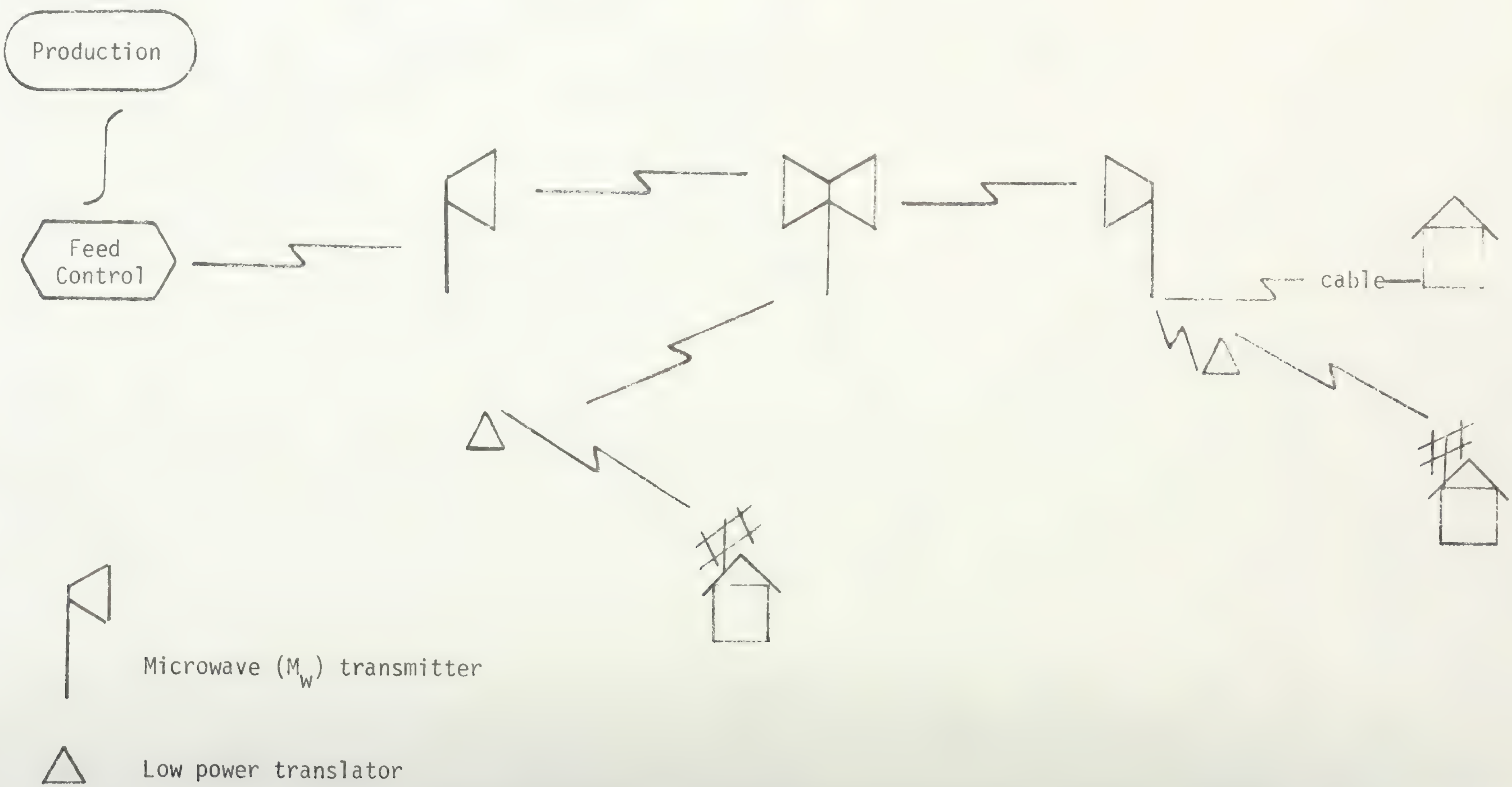
The state of Nevada university system is attempting to install the "Nevada Plan" to centrally operate outlying receive only satellite dishes by remote control. The signal received would be broadcast, and local programming and news could be inserted. The installation would cost about $85,000. Operating expenses, for a community of 400 households, would be approximately $12 per year. See Attachment K. Several Montana communities are attempting to join the Nevada plan.

The state of Montana permits the creation and operation of TV tax districts for the provision of TV service. Such districts could fund, in whole or in part, PTV service such as Alaska's and Nevada's plans.

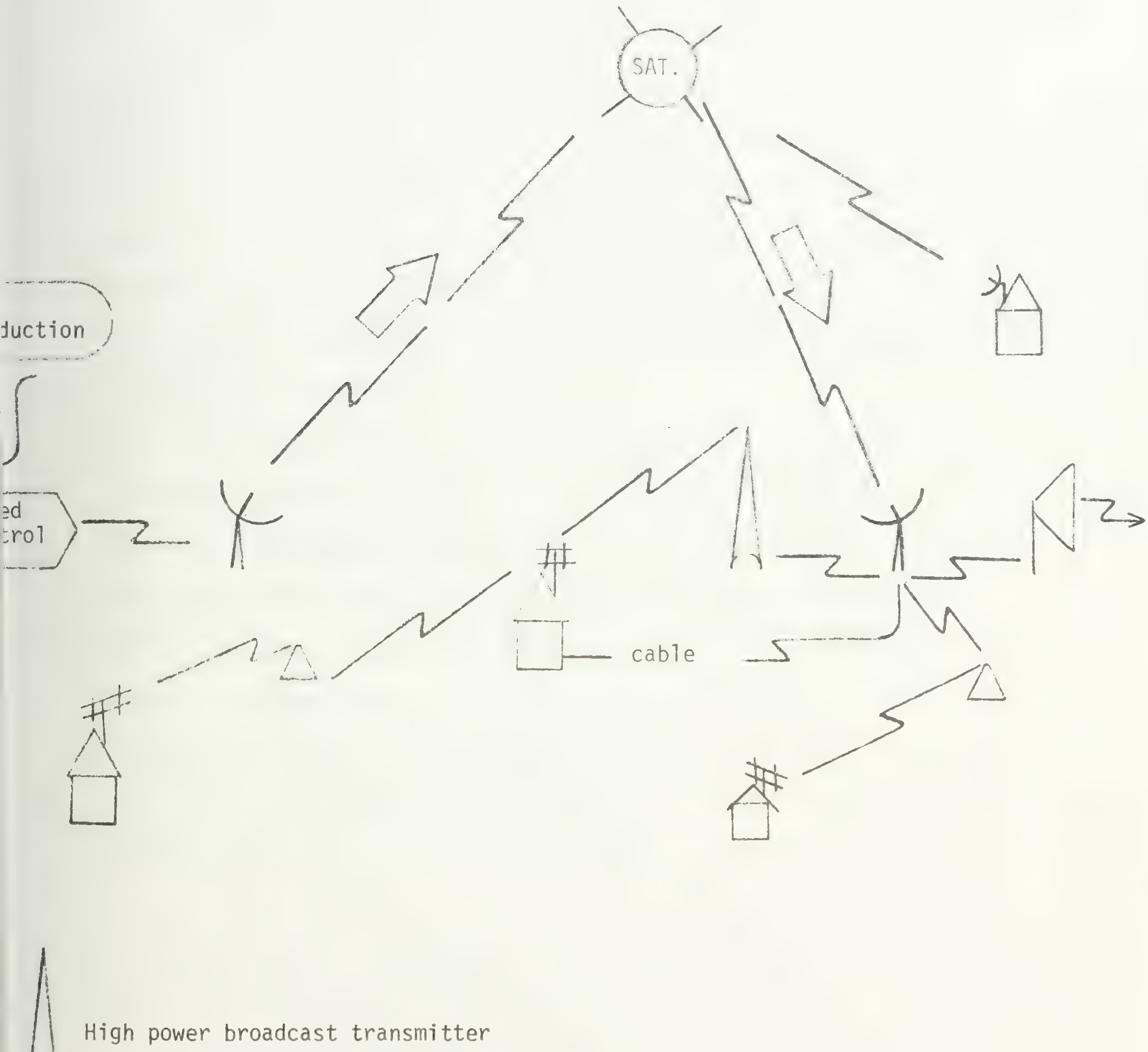
BROADCAST PTV SIGNAL DISTRIBUTION



MICROWAVE PTV SIGNAL DISTRIBUTION



SATELLITE PTV SIGNAL DISTRIBUTION



High power broadcast transmitter

Low power broadcast transmitter (translater)

Microwave (M_W) transmitter/repeater

FUTURE DEVELOPMENTS IN PTV

The technology presently exists to broadcast programming by a satellite, or series of satellites, and receive the signal on a small dish in the home. The home unit consists of a roof mount antenna as small as three feet wide, and the electrical equipment necessary to convert the microwave signal into a TV signal. Japan has such an experimental system in place, and two American firms are applying to the FCC for permission to create such a system in the U.S. The proposals are opposed by both broadcasters and cable companies for obvious commercial reasons. Such a system would be able to reach virtually every household in the U.S.

The new technology is possible because higher frequency satellites are to be launched in the 1980's which will transmit from the satellite at considerably higher power levels. The "footprints" of the signals (the areas receiving it) will cover the country and, as proposed, will do so according to time zones. The higher power permits use of a smaller receiving dish.

Comsat and Sears, Roebuck Company recently discontinued negotiations which would have resulted in combining Comsat's satellite service (very similar to PBS) with a national distributor and maintenance company. The service, according to industry guesses, would have cost about $350 for installation and $15-$25 per month. Comsat (Communications Satellite Corporation of America) is now looking for other partners in the venture.

If the FCC eventually authorizes direct satellite broadcasting within the next 3-6 years, as many in the industry expect, the state must weigh the risk involved in spending large sums of money for PTV which might be bypassed by new technology.

PBS does not permit anyone to (legally) receive its transmissions except for rebroadcast by PBS affiliate stations, which fill in "dead time" and perform other technical programming services. PBS is funded primarily by the Corporation for Public Broadcasting (CPB), which is in turn funded by Congress. If the Corporation for Public Broadcasting undergoes the deep funding cuts proposed by President Reagan (50%), there will be pressure on PBS to make up funding shortfalls. If PBS changes its practices to expand the number of affiliates buying its feed, it may become possible to install satellite receiving dishes with attached low power transmitters wherever needed for as little as $20,000 - $25,000.

The key consideration in reviewing future technological and economic developments in PTV is that they may radically alter the desireability of any system put in place in the near future.

CONCLUSIONS

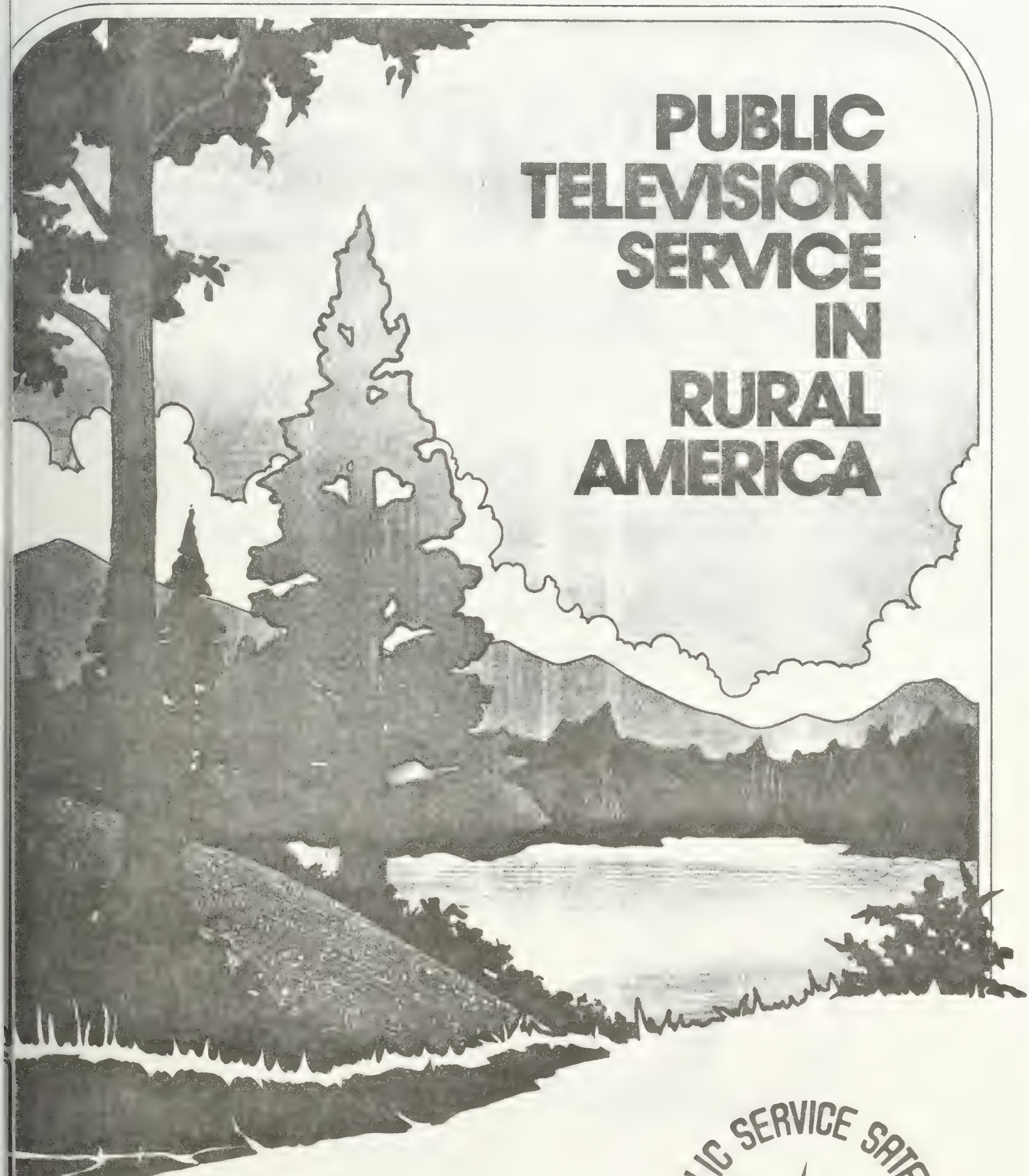
Of the three major signal distribution technologies considered - broadcast, satellite, microwave - the broadcast scheme considered would clearly be the most costly. Depending on the scheme used, and on whether Montana programming is considered crucial, either satellite or microwave is the least expensive. It is probable that future developments - such as the Alaska PTV or Nevada satellite plans - will drive PTV costs down in the future.

Much of the information contained in this report is preliminary and non-specific in nature due to time and money constraints. It is also beyond the purvue of the Telecommunications Project to draw conclusions of an economic and political nature which are largely legislative in thrust. It is believed, however, that the options from which the state may choose have been defined in a manner conducive to informed discussion, along with the consequences.

Public television is, in all probability, an eventuality in Montana - very possibly within the next decade. The question is, therefore, less when than how; less how much it will cost than whether the state helps pay for it as the public corporate body; less a question of technical feasibility than the desire to have it and the willingness of groups to acquire or provide it in the absence of an official state commitment.

ATTACHMENT A

PUBLIC TELEVISION SERVICE IN RURAL AMERICA



A Study Conducted by
PUBLIC SERVICE SATELLITE CONSORTIUM
for the
Corporation for Public Broadcasting

January 1979
FINAL REPORT

PUBLIC SERVICE SATELLITE CONSORTIUM

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Office of Engineering Research
Technical Report 791

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ABSTRACT

The Public Service Satellite Consortium, (PSSC), under contract to the Corporation for Public Broadcasting, conducted a study to examine operational alternatives for extending or improving public television service to rural America.

Selected communities in Wyoming, Montana and the Appalachia region were surveyed. PSSC coordinated the surveys in Wyoming and Montana. The Appalachian Education Satellite Program (AESP), under subcontract to PSSC, surveyed and reported on rural communities in the Appalachia region.

The need to extend public television service to geographically isolated communities has been well-documented in the past, however, it has not been technically or economically feasible. Accordingly, the impetus for this study was due in part to recent developments in telecommunications technology in concert with the recognized need for improved services to rural communities.

High-power satellite systems and the trend toward lower cost earth stations, make it possible to receive television programs directly from the satellite in areas which are not adequately served by existing public television stations. The advent of the public television satellite system, which will use the WESTAR satellite to deliver PBS programs on a nation-wide basis, provides an opportunity to initiate an operational plan to extend public television to rural America.

An information base was required to design a meaningful implementation plan. As part of the study, site surveys were conducted in Montana, Wyoming (the only two states which do not have at least one public television station) and rural Appalachia. A total of 47 rural communities were surveyed -- 17 in Montana, 17 in Wyoming, 13 in Appalachia. Data gathered during the site surveys included both community information and technical information to determine community interest in public television as well as the technical and financial requirements for receiving public television using small earth stations in conjunction with mini-transmitters, cable systems, and translators.

Abstract

The findings from the study indicate that commercial television has saturated the continental U.S. Commercial television is now available in the most rural of communities because of extensive cable and translator service. Public television, on the other hand, is still not available in large areas of Montana and Wyoming. Where it is available, the quality is often poor or spotty. Public television in Appalachia is more prevalent, however, the signal quality is poor in many rural, isolated communities.

In regard to local origination, there was mixed interest on the part of the communities. The costs involved and the potential use in a small community were cited most often as reasons for their limited interest in local origination. The community's priority was in receiving a high quality public television signal at a modest cost.

Although the findings from this study revealed a great interest in public television on the part of rural communities, a limited understanding of the nature of public television and a general lack of awareness regarding public television programs was evident.

The realization that outside funding would be required to implement any plan was paramount. Technical and financial support from appropriate agencies will be required to enable unserved rural communities to receive a high quality public television signal.

By design, this study focused on rural communities in Montana, Wyoming and Appalachia; however, the procedures and guidelines should prove useful in similar efforts to expand public television service to other regions of the country.

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SECTION I
BACKGROUND OF THE STUDY

Purpose

Although tremendous gains have been made in public television service in recent years, many rural communities continue to be unserved. The advent of the public television satellite system will improve the quality and increase the capacity of public broadcasting, but will not resolve the lack of public television service in rural, geographically isolated communities.

This project examined operational alternatives, requirements, and costs to extend public television service to rural America. The study also generated recommendations and strategies for implementation.

Rationale

The Corporation for Public Broadcasting and Western Union signed a contract in June 1976 to provide WESTAR satellite service to the Public Broadcasting Service, National Public Radio, and the participating public broadcasting stations. The public television satellite system, which will be fully operational by January 1979, will interconnect public television stations by satellite and replace the present terrestrial interconnection consisting of land lines and microwave equipment.

Public Broadcasting Service (PBS) programs will be broadcast on a nationwide basis to 152 receive-only earth terminals located at public television stations throughout the country. In addition, this satellite interconnection will provide real time transmission to Hawaii, Alaska, Puerto Rico and the Virgin Islands -- areas presently receiving programming on a delayed basis.

A large number of rural communities, however, remain unserved. Through the use of small earth stations and mini-transmitters, or in conjunction with existing translator and cable systems, public television

can also be extended to unserved rural communities.

Traditionally, rural communities are described by density characteristics. The "rural" population has been defined by the Bureau of the Census as people who live in areas with less than 2,500 inhabitants. However, any analysis of rural communities must include such factors as limited accessibility to conventional means of transportation to population centers and limited accessibility to communications systems, including public television.

The screening criteria used in selecting communities was: rural community in Montana, Wyoming or Appalachia with a population under 2,500; not in proximity to a population center; limited or no access to a public television signal; interest and willingness to participate in the study.

Goals and Objectives

The goals of this project were to identify and survey rural communities and to assist them in formulating operational plans for gaining access to or improving public television service. Specifically, the objectives were:

- to survey rural communities in Wyoming, Montana and Appalachia without adequate public television service;
- to communicate with decision makers in selected rural communities to ensure local input in planning and development;
- to analyze the advantages and disadvantages of available options for extending public television service to rural communities;
- to describe technical and financial requirements for receiving public television service using small earth stations in conjunction with mini transmitters, cable systems and translators;
- to describe technical and financial requirements for limited local origination capability;
- to formulate recommendations that will enable rural communities to gain access to or improve public television service;
- to outline the procedures for acquiring, maintaining and operating equipment and facilities to enable rural communities to receive public television service.

Methodology

In conducting the study, PSSC used a three-phase approach.

Phase I: Development of Information Base. PSSC compiled the necessary information base and developed techniques and procedures for conducting the site surveys. Specifically in Phase I, PSSC examined in detail the technical and economic aspects of utilizing small earth stations, mini-transmitters, cable systems and translators. Questions addressed in Phase I include the advantages, limitations, costs, system parameters, compatibility, regulatory and operational requirements. Operating arrangements were explored, including interface with the organization responsible for local distribution and/or origination.

Phase II: Field Activities. Phase II focused on field-related activities including site selection, training staff to conduct site surveys, and actual site surveys. The data base compiled in Phase I served as the framework for Phase II field activities. Information on equipment, facilities, costs, community demographics, etc., were incorporated in survey instrumentation and the site survey training program.

Four two-person survey teams in Montana and Wyoming, and a three-person team in Appalachia, had primary responsibility for the site surveys and interviews. Site survey teams were selected because of their familiarity with the respective areas to be surveyed and their technical background. Field activities extended over a five-week period. The first week was essentially orientation and training, followed by three weeks of intensive survey and interview activities in each state or region, and one week to prepare final state or regional reports. Within three days of completing each site survey, the team was required to submit to PSSC a community profile, daily survey log and interview summary, site survey questionnaire (Part A-Community Information; Part B-Technical Information) and a final site report. A copy of survey reporting forms are included in Appendix F.

Phase III: Analysis. Information from the site surveys was compiled and analyzed. Documentation efforts during the study focused primarily on descriptive data. Charts and matrices were used to compile, illustrate and analyze the process and outcomes. Data included demographics, community resources (technical, non-technical, human) attitudinal and costs and requirements.

Because the study was based on a selection of towns and town leaders, rather than a sampling among all towns and townspeople, the data is subject to sampling errors. Moreover, survey results were obtained in different settings and situations. Therefore, caution should be used in interpreting raw survey data. The findings, conclusions and recommendations, however, are representative of composite data from each site surveyed and will be utilized to draw inferences to assist other communities with limited access to public television.

SECTION 2
FINDINGS

The major findings gleaned from the Wyoming and Montana surveys are presented separately from those of Appalachia. Although there are distinct similarities, patterns and generalizations, there are some differences in survey methodology and procedures. The format for compiling, analyzing and interpreting the data provides additional justification for a separate list of findings. The conclusions and recommendations in the PSSC report, however, reflect composite findings.

The tabular summary of survey team reports summarizes technical information on each rural community surveyed. This information was synthesized from field reports submitted by survey teams and from other reference sources. It has been compiled in table form so that data on each community can be compared and contrasted, and to facilitate data analysis and interpretation.

Field reports submitted by survey teams, which contain the raw data on each rural community surveyed, are on file at PSSC. Sample reports have been included in the appendix.

Wyoming and Montana

- of the 72 communities screened, no community was identified which did not receive commercial television.
- of the 72 communities screened, 54 did not receive PTV.
- of the 54 communities screened which did not receive PTV, three were not interested in participating in the site survey.
- 34 of the 34 sites surveyed expressed an interest in receiving PTV.
- 19 of the 34 sites surveyed expressed some interest in local origination.
- 34 of the 34 sites surveyed expressed concern regarding costs to receive PTV.
- 19 of the 34 sites surveyed were willing to support such an effort to bring in PTV. Although the level of local support varied, no one community could support total system costs.

-17 of the 34 sites surveyed received commercial TV signals by direct broadcast.

-27 of the 34 sites surveyed received commercial TV signals by translator.

-2 of the 34 sites surveyed received commercial TV signals by cable.

-15 of the 34 sites surveyed expressed an interest in a cooperative effort to serve more than one community or to serve residents beyond the town limits.

✓ As a function of expediency and cost:

-24 of the 34 sites surveyed could best be served using a small earth station/mini-transmitter combination.

-one of the 34 sites surveyed could best be served using a small earth station at the head-end of the local cable system.

-6 of the 34 sites surveyed could best be served using a translator to re-broadcast a distant PTV signal.

-3 of the 34 sites surveyed will be, or are receiving PTV through existing translator or cable systems.

<u>Appalachia</u>

-all Appalachian communities in Mississippi are reported to receive public broadcasting signals.

-Appalachian communities in Alabama report 95% public broadcasting coverage.

-Appalachian communities in South Carolina, Ohio and Maryland indicated extensive public broadcasting coverage.

-the majority of communities in the remaining Appalachian states are reported to receive public television, although the quality of the signal is poor or spotty in many communities.

-13 of the 13 sites surveyed received commercial TV.

-2 of the 13 sites surveyed do not receive public TV.

-11 of the 13 sites surveyed indicated the public television signal was poor or spotty.

-13 of the 13 sites surveyed expressed an interest in receiving or improving PTV.

-7 of the 13 sites surveyed expressed some interest in local origination.

- -13 of the 13 sites surveyed expressed concern regarding costs.
- -11 of the 13 sites surveyed were willing to provide some support to improve public TV service.
- -4 of the 13 sites surveyed received commercial TV only by direct broadcast.
- -5 of the 13 sites surveyed received commercial TV by direct broadcast or translator.
- -3 of the 13 sites surveyed received commercial TV only by cable.
- -One of the 13 sites surveyed received commercial TV by direct broadcast or by cable.
- -6 of the 13 sites surveyed received some public television by direct broadcast.
- -2 of the 13 sites surveyed received some public television by translator.
- -3 of the 13 sites surveyed received some public television by cable.
- -11 of the 13 sites surveyed could improve or extend public television service through the use of a translator.
- -In addition, a mini-transmitter was suggested for 5 of the 11 translator sites because of their high interest in local origination. However, if the signal is received in the community by direct broadcast, it will require demodulation to interface with the mini-transmitter. Conversely, local origination in conjunction with a translator will require modulation of the signal for distribution to the community.
- -A small earth station/mini-transmitter combination was recommended for Sylva, NC. It might also be advisable to consider a small earth station to improve signal quality at two other sites where a translator feed requires multiple hops. A small earth station at the head-end of two of the existing cable systems could also improve poor signal quality. In another community, classified as a federal government Radio Quiet Zone, transmitters and translators are restricted. To improve the public television signal would require upgrading of the cable system. The use of a small earth station should also be investigated.

TABULAR SUMMARY OF SURVEY TEAM REPORTS

SURVEY SITES (population) WYOMING	Edgerton 650	Midwest 560	Burns 232
I. Present Television Reception A. Channel No., Call Letters-city (affiliate: A-ABC C-CBS N-NBC I-independent)	Ch.2-KTWO Casper (A,N,C) Ch.9-KBHE Rapid City (PBS)	Ch.2-KTWO Casper (A,N,C) Ch.9-KBHE Rapid City (PBS) Very, very poor	Ch.2-KWGN Denver (I) Ch.5-KYCU Cheyenne (C) Ch.6-KRMA Denver (PBS) Ch.7-KMGH Denver (C) Ch.9 KBTV Denver (A)
B. quality of signals 3-good 2-fair 1-poor	1 - all channels	1 - all channels	1 - all channels
C. reception by: (1) T-translator C-cable; O-other (2) Translator (output) channels (3) Power (watts)	Direct-Ch. 2 Translator (input) Ch.9 Ch. 7 1 watt	Direct-Ch. 2 Translator (input) Ch.9 Ch. 7 1 watt	Direct N/A N/A N/A
D. nearest public TV station: (1) Ch. No. Call letters-city (2) Distance(miles)direction	Channel 9 KBHE Rapid City, SD 160 miles NE	Channel 9 KBHE Rapid City, SD 165 miles NE	Channel 6 KRMA Denver, CO 100 miles SW
II. Suggested Receive System A. type (E-earth station MT-mini-transmitter T-translator C-cable)	E/MT (Prefer multi-town reception.	E/MT Cable franchise pending. One system shared between these towns + 2 others.)	T
B. suggested location	On bluff East of towns - Central to four towns - area	also considered as site by Cable Company.	Center of town - 100 ft. w tower.
C. area to be covered	4 sq.miles plus	1 sq. miles plus	15 mls radius.(Prefer multi-town reception.)
D. suggested power (watts)[1]	100 VHF	100 VHF	10 VHF
E. restrictions (other than dollars or terrain)	None noted	None noted	None noted
F. estimated cost[2]	\$45,635 - \$54,761	\$45,635 - \$54,761	\$17,790 - \$21,354
III. Local Origination A. interest (3-hi, 2-med, 1-lo, 0-no)	1	1	1
B. proposed location	School	School	School
C. equipment available	Yes	Yes	Yes
IV. Community Interest and Support A. interest in receiving PTV	2	2	2*
B. willingness to provide support (3-high, 2-med, 1-low, 0-no) *community indicated certain limitations may apply	1*	1*	2*

1. *In all cases effective radiated power (ERP) will be greater than transmitter power, depending on transmitter antenna gain.*
2. *Does not include real estate costs, equipment shelter costs, power service and consumption.*

TABULAR SUMMARY OF SURVEY TEAM REPORTS

SURVEY SITES (population) WYOMING	Glendo 800	Glenrock 3000	Manville 100+
I. Present Television Reception A. Channel No., Call Letters-city (affiliate: A-ABC, C-CBS, N-NBC, I-independent)	Ch.2-KTWO Casper (A,N,C) Ch.4-KDUH Hay Springs (N) Ch.5-KYCU Cheyenne (C) (*PTV will be Ch. 6)	Ch.2-KTWO Casper (A,N,C) KWGN Denver (I?) Ch.4-KOA Denver (N) Ch.6-KRMA Denver (PBS) Ch.9-KBTV Denver (A)	Ch.2-KTWO Casper (A,N,C) Ch.4-KDUH Hot Springs (N)
B. quality of signals 3-good 2-fair 1-poor	2 - all channels	3 - all channels	1 - all channels
C. reception by: (1) T-translator C-cable; O-other	Translator-all channels	Cable-all channels	Direct
(2) Translator (output) channels	12 8 3 6*	Cable channels not given	N/A
(3) Power (watts)	5W 1W 5W 5W	N/A	N/A
D. nearest public TV station: (1) Ch. No. Call letters-city (2) Distance(miles)direction	Ch.13 KTNE Alliance, NB 120 miles ESE	Ch.13 KTNE Alliance, NB 160 miles SE	Ch.13 KTNE Alliance, NB 90 miles SE
II. Suggested Receive System A. type (E-earth station, MT-mini-transmitter, T-translator, C-cable)	REA translator being re-built; will bring PTV	Already receives PTV via local cable system	T
B. suggested location	N/A	N/A	State policy tower, 4 miles north of town
C. area to be covered	2 sq.mls + (prefer multi-town reception)	7-9 sq.mls. (prefer multi town reception)	Less than 1 sq.ml. (Prefer county-wide reception)
D. suggested power (watts)[1]	N/A	N/A	100 UHF
E. restrictions (other than dollars or terrain)	none noted	none noted	none noted
F. estimated cost[2]	N/A	N/A	$17,790 - $21,354
II. Local Origination A. interest (3-hi, 2-med, 1-lo, 0-no)	1	2	1 - lack of people and funds
B. proposed location	N/A	School/cablehead	Lusk school
C. equipment available	N/A	Yes	Yes - Lusk
IV. Community Interest and Support A. interest in receiving PTV	0 - 1	N/A	3
B. willingness to provide support (3-high, 2-med, 1-low, 0-no) *community indicated certain limitations may apply	1	N/A	3*

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TABULAR SUMMARY OF SURVEY TEAM REPORTS

SURVEY SITES (population) WYOMING	Manderson 150	Pavillion 300	Ten Sleep 450
I. Present Television Reception A. Channel No., Call Letters-city (affiliate: A-ABC C-CBS N-NBC I-independent)	10-KWRB-Thermopolis (A,N,C) 2-KTWO Casper (A,N,C) 2-KTVQ Billings (C,N)	Ch.2 (some receive) KTWO Casper (A,N,C) Ch.10 (most receive) KWRB Thermopolis (A,N,C)	Most receive only one c Ch.2-KTWO Casper A,N,C) Ch.10-KWRB Thermopolis
B. quality of signals 3-good 2-fair 1-poor	1 all channels	1 all channels	1 all channels
C. reception by: (1) T-translator C-cable; 0-other	Translator-all channels	Translator-all channels	0 - microwave
(2) Translator (output) channels	Translator channels not given.	Translator channels not given.	N/A
(3) Power (watts)	Power not given	Power not given	N/A
D. nearest public TV station: (1) Ch. No. Call letters-city	Channel 10 KBGL Pocatello, ID	Channel 10 KBGL Pocatello, ID	Channel 9 KBHE Rapid City, SD
(2) Distance(miles)direction	235 miles SW	180 miles WSW	220 miles ESE
II. Suggested Receive System A. type (E-earth station MT-mini-transmitter T-translator C-cable)	E/MT (present translator site)	E/MT	E/MT
B. suggested location	Waterwell Hill	City owned water tower-	On a bluff at edge of town
C. area to be covered	0.18 square miles	0.15 square miles	0.14 square miles
D. suggested power (watts)[1]	10 VHF	10 VHF	10 VHF
E. restrictions (other than dollars or terrain)	None noted	None noted	None noted
F. estimated cost[2]	$36,860 - $44,232	$36,860 - $44,232	$36,860 - $44,232
III. Local Origination A. interest (3-hi, 2-med, 1-lo, 0-no)	2	0	0
B. proposed location	School/Town Hall	N/A	N/A
C. equipment available	Yes	N/A	Yes
IV. Community Interest and Support A. interest in receiving PTV	3*	3*	3
B. willingness to provide support (3-high, 2-med, 1-low, 0-no) *community indicated certain limitations may apply	3*	1*	3

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2. Does not include real estate costs, equipment shelter costs, power service and consumption.

SURVEY SITES (population) WYOMING	Shoshoni 900	Mammoth Hot Springs 200	Afton 1500
I. Present Television Reception A. Channel No., Call Letters-city (affiliate: A-ABC C-CBS N-NBC I-independent)	Ch.2 KTWO Casper (A,N,C) Ch.10 KWRB Thermopolis (A,N,C)	Ch.2 KTVQ Billings (C,N) Ch.3 KID Idaho Falls (C) Ch.8 KULR Billings (A,N,C)	Ch.3 KID Idaho Falls (C) Ch.6 KP[illegible] Pocatello (A) Ch.8 KIFI Idaho Falls (N)
B. quality of signals 3-good 2-fair 1-poor	1 - all channels	2 - all channels	3 - all channels
C. reception by: (1) T-translator C-cable; O-other (2) Translator (output) channels (3) Power (watts)	Translator (Ch.2) Direct (Ch.10) 13 power not given	Translator - all channels 10 6 12 1W 5W 1W	Translator - all channels Translator-channels not given 10W - all channels
D. nearest public TV station: (1) Ch. No. Call letters-city (2) Distance(miles)direction	Channel 7 KUED Salt Lake City 220 miles SW	Channel 10 KBGL Pocatello, ID 180 miles SW	Channel 10 KBGL Pocatello, ID Ch.10 80 miles NW
II. Suggested Receive System A. type (E-earth station MT-mini-transmitter T-translator C-cable)	E/MT (present translator site)	E/MT (present translator site)	T
B. suggested location	3 mls. north of town	Bunsen Peak - 4 miles south of town	Big Ridge Peak - north-east of town
C. area to be covered	3½ square miles	2 sq.mls plus	200 sq.mls
D. suggested power (watts)[1]	10 VHF	10 VHF Prefer multi-town reception	10 VHF Prefer multi-town reception
E. restrictions (other than dollars or terrain)	None noted	None noted	None noted
F. estimated cost[2]	$36,860 - $44,232	$36,860 - $44,232	$17,790 - $21,354
III. Local Origination A. interest (3-hi, 2-med, 1-lo, 0-no)	3	3 - (later)	0
B. proposed location	School	Park radio station	N/A
C. equipment available	Yes	Yes	Yes
IV. Community Interest and Support A. interest in receiving PTV	3	3	3
B. willingness to provide support (3-high, 2-med, 1-low, 0-no) *community indicated certain limitations may apply	3*	3	3

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SURVEY SITES (population) WYOMING	Burlington 100	Hyattsville 54	Lusk 1490
I. Present Television Reception A. Channel No., Call Letters-city affiliate: A-ABC C-CBS N-NBC I-independent)	Ch.10-KWRB Thermopolis (A,N,C) (Ch.10 is Riverton channel#, Thermopolis cable channel # for Ch.10 not given.)	Ch.2-KTWO Casper (A,N,C) Ch.8-KULR Billings (A,N,C) Ch.10-KWRB Thermopolis (A,N,C)	Ch.2-KTWO Casper (A,N,C) Ch.5-KIVV Deadwood (A,C Ch.7-KEVN Rapid City (A,
B. quality of signals 3-good 2-fair 1-poor	1 - all channels	1 - all channels	1 - all channels
C. reception by: (1) T-translator C-cable; O-other (2) Translator (output) channels (3) Power (watts)	Direct N/A N/A	Direct N/A N/A	Translator-all channels 12 8 10 Power not given
D. nearest public TV station: (1) Ch. No. call letters - city (2) Distance(miles)direction	Channel 10 KBGL Pocatello, ID 235 miles S.W.	Channel 10 KBGL Pocatello, ID 240 miles S.W.	Channel 13 KTNE Alliance, NB 90 miles S.E.
II. Suggested Receive System A. type (E-earth station MT-mini-transmitter T-translator C-cable)	E/MT	E/MT	T
B. suggested location	Twin Peaks - northwest of town.	Water tower on bluff above town	State polic tower - 4 miles north of Manville
C. area to be covered	0.15 square miles	0.064 square miles	Less than 4 square miles
D. suggested power (watts)[1]	10 VHF	10 VHF	10 VHF
E. restrictions (other than dollars or terrain)	none noted	none noted	none noted
F. estimated cost[2]	$36,860 - $44,232	$36,860 - $44,232	$17,790 - $21,354
III. Local Origination A. interest (3-hi, 2-med, 1-lo, 0-no)	0	0	2
B. proposed location	N/A	N/A	School/jail
C. equipment available	N/A	N/A	Yes
IV. Community Interest and Support A. interest in receiving PTV	2*	2*	3
B. willingness to provide support (3-high, 2-med, 1-low, 0-no) *community indicated certain limitations may apply	1	1*	3

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2. *Does not include real estate costs, equipment shelter costs, power service and consumption.*

TABULAR SUMMARY OF SURVEY TEAM REPORTS

SURVEY SITES (population) WYOMING	Medicine Bow 1000	Sundance 1150	Frannie 139
I Present Television Reception A. Channel No., Call Letters-city (affiliate: A-ABC C-CBS N-NBC I-independent)	Ch.2-KTWO Casper (A,N,C) Ch.7-KMGH Denver (C) Ch.9 KBTV Denver (A)	Ch.2-KTWO Casper (A,N,C) Ch.3-KOTA Rapid City (NC) Ch.5-KIVV Lead (A,C) Ch.7 KEVN Rapid City (AC)	Site Survey Cancelled
B. quality of signals 3-good 2-fair 1-poor	1 - all channels 3rd generation translator	2 - all channels	
C. reception by: (1) T-translator C-cable; O-other (2) Translator (output) channels (3) Power (watts)	Translator - all channels 13 7 9 power not given	Direct-Chs. 3 & 7 Translator input Ch. 2 & Ch.5 Translator output Chs 9 & 12.	
D. nearest public TV station: (1) Ch. No. Call letters-city (2) Distance(miles)direction	Channel 6 KRMA Denver. CO 160 miles SSE	Channel 9 KBHE Rapid City, SD 50 miles ESE	
II. Suggested Receive System A. type (E-earth station MT-mini-transmitter T translator C cable)	E/MT (present translator site)	T	
B. suggested location	Como Ridge	Sundance Peak - South of town	
C. area to be covered	2 sq. mls plus	1 sq. mile plus	
D. suggested power (watts)[1]	10 VHF prefer multi-town reception	10 VHF prefer multi-town reception	
E. restrictions (other than dollars or terrain)	None noted	None noted	
F. estimated cost[2]	$36,860 - $44,232	$7,570 - $9,084	
. Local Origination A. interest (3-hi, 2-med, 1-lo, 0-no)	2	1	
B. proposed location	School/Town Hall	School	
C. equipment available	Yes	Yes	
V. Community Interest and Support A. interest in receiving PTV	2	3*	
B. willingness to provide support (3-high, 2-med, 1-low, 0-no) *community indicated certain limitations may apply	1*	3*	

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TABULAR SUMMARY OF SURVEY TEAM REPORTS

SURVEY SITES (population) MONTANA	Boulder 1800	Broadus 1000	Roundup 2235
I. Present Television Reception A. Channel No., Call Letters-city (affiliate: A-ABC, C-CBS, N-NBC, I-independent)	Ch.3 KRTV Great Falls (N,C) Ch.4 KXLF Butte (A,C) Ch.13-KGVO Missoula (N,C)	Ch.2-KTVQ Billings (C,N) Ch.8 KULR Billings (A,N,C) Ch.11 KHSD Lead (N,C)	Ch.2-KTVQ Billings (C, Ch.8 KULR Billings (A,
B. quality of signals 3-good 2-fair 1-poor	3 - all channels	2 - all channels	2 - all channels
C. reception by: (1) T-translator, C-cable; O-other (2) Translator (output) channels (3) Power (watts)	Translator - all channels 10 7 [illegible] 1W 10W 1W	Translator - all channels 6 4 3 10W all channels	Translator - all channe 11 13 10W all channels
D. nearest public TV station: (1) Ch. No. Call letters-city (2) Distance(miles)direction	Ch.10-KBGL Pocatello, ID 240 miles SSW Ch.7 KUED Salt Lake City,UT 380 miles SSW	Ch.9 KBHE Rapid City, SD 150 miles SE	Ch.9-KBHE Rapid City, S 300 miles SE
II. Suggested Receive System A. type (E-earth station, MT-mini-transmitter, T-translator, C-cable)	E/MT (either of two present translator sites)	E/MT (present translator site)	E/MT (present translator sit
B. suggested location	1½ miles west of town OR 2 miles south of town.	3½ mls SE town.	Rim of hill North of town
C. area to be covered	1 square mile	400 sq.mls,30 mi. radius Prefer country coverage	1½ square miles
D. suggested power (watts)[1]	10 VHF	10 VHF	10 VHF
E. restrictions (other than dollars or terrain)	None noted	None noted	None noted
F. Estimated cost[2]	$36,860 - $44,232	$36,860 - $44,232	$36,860 - $44,232
III. Local Origination A. interest (3-hi, 2-med, 1-lo, 0-no)	3	0	0
B. proposed location	not given	N/A	N/A
C. equipment available	yes	yes	yes
IV. Community Interest and Support A. interest in receiving PTV	3*	3	3
B. willingness to provide support (3-high, 2-med, 1-low, 0-no) *community indicated certain limitations may apply	3*	3	3

1. In all cases effective radiated power (ERP) will be greater than transmitter power, depending on transmitter antenna gain.
2. Does not include real estate costs, equipment shelter costs, power service and construction.

TABULAR SUMMARY OF SURVEY TEAM REPORTS

[illegible] SITES (population) MONTANA	Chester 1000	Chinook 1900	Philipsburg 1200
Present Television Reception A. Channel No., Call Letters-city affiliate A-ABC, C-CBS, N-NBC, I-independent)	Ch.3-KRTV Great Falls (N,C) Ch.5-KFBB Great Falls (A,N,C) CFCN Lethbridge (CTV) Ch.7-CJOC Lethbridge (CBC)	Ch.3-KRTV Gt.Falls(N,C) Ch.5-KFBB Gt.Falls (A,N,C) Ch.5-CFCN Lethbridge (CTV) Ch.7 CJOC Lethbridge (CBC)	Ch.4 KXLF Butte (A,C) Ch.13 KGVO Missoula (N,C)
quality of signals 3-good 2-fair 1-poor	2 - all channels	1 - all channels	3 - all channels
C. reception by: (1) T-translator C-cable; O-other (2) Translator (output) channels (3) Power (watts)	Translator - all channels Translator chs. not given 10W-all channels	Translator - all channels 6 2 4 1W 1W 10W	Translator - all channels 7 9 power not given
D. nearest public TV station: (1) Ch. No. Call letters-city (2) Distance(miles)direction	Ch.7-KSPS Spokane, WA 300 miles WSW	Ch.7-KSPS Spokane, WA 370 miles WSW	Ch.12-KUID Moscow, ID 170 miles WNW
II. Suggested Receive System A. type (E-earth station MT-mini-transmitter T-translator C-cable)	E/MT	E/MT	E/MT
B. suggested location	To be determined	To be determined	To be determined
C. area to be covered	2 sq.mls +. Want to cover entire county	1 sq.ml+. Want to cover entire county	5 sq.miles +. Need multi-town reception
D. suggested power (watts)[1]	10 VHF	10 VHF	10 VHF
E. restrictions (other than dollars or terrain)	None noted	None noted	None noted
F. estimated cost[2]	$36,860 - $44,232	$36,860 - $44,232	$36,860 - $44,232
Local Origination A. interest (3-hi, 2-med, 1-lo, 0-no)	1	1	1
B. proposed location	School	School	School
C. equipment available	Yes	Yes	No
V. Community Interest and Support A. interest in receiving PTV	3	2	2
B. willingness to provide support (3-high, 2-med, 1-low, 0-no) *community indicated certain limitations may apply	2	3*	3*

1. [illegible] effective radiated power (ERP) will be greater than transmitter power, depending on transmitter antenna gain.
2. Does not include real estate costs, equipment shelter costs, [illegible] service and consumption.

SURVEY SITES (population) MONTANA	Circle 1050	Harlowton 1375	Jordan 531
I. Present Television Reception A. Channel No., call letters, city (affiliate: A-ABC C-CBS N-NBC I-independent)	Ch. [illegible] KXGN Glendive (C,N) Ch. 8 KUMV Williston (N,A) Ch. 11-KXMD Williston (C,A)	Ch. [illegible] KTVQ Billings (C,N) Ch. [illegible] KULR Billings (A,N,C)	Ch. 3 KRTV Gt. Falls (N,[illegible] Ch. [illegible] KULR Billings (A,N[illegible]
B. quality of signals 3-good 2-fair 1-poor	2-all channels	2-all channels	2-all channels
C. reception by: (1) T-translator C-cable; O-other (2) Translator (output) channels (3) Power (watts)	Translator - all channels 9 10 4 10W 10W 10W	Translator-all channels 10 13 10w - all channels	Translator-all channels ? 9 power not given
D. nearest public TV station: (1) Ch. No. Call letters-city (2) Distance(miles)direction	Ch.9-KBHE Rapid City, SD 240 mls - SSE	Ch.10 KBGL Pocatello, ID 280 mls - SSW	Ch.9-KBHE Rapid City, SD 280 mls. SSE
II. Suggested Receive System A. type (E-earth station MT-mini-transmitter T-translator C-cable)	E/MT	E/MT (present translator site)	E/MT
B. suggested location	To be determined	6½ mls S. of town	To be determined
C. area to be covered	Town 3/4 sq.ml radius	1/2 sq.mile	1/2 sq.mile
D. suggested power (watts)[1]	10 VHF	10 VHF	10 VHF
E. restrictions (other than dollars or terrain)	none noted	none noted	none noted
F. estimated cost[2]	\$36,860 - \$44,232	\$36,860 - \$44,232	\$36,860 - \$44,232
III. Local Origination A. interest (3-hi, 2-med, 1-lo, 0-no)	0	0	0
B. proposed location	N/A	N/A	N/A
C. equipment available	Yes	Yes	Yes
IV. Community Interest and Support A. interest in receiving PTV	3	2*	0-1
B. willingness to provide support (3-high, 2-med, 1-low, 0-no) *community indicated certain limitations may apply	3	0-1*	0

1. *In all cases effective radiated power (ERP) will be greater [illegible], depending on transmitter antenna gain.*
2. *Does not include real estate costs, equipment shelter costs, [illegible].*

TABULAR SUMMARY OF SURVEY TEAM REPORTS

SURVEY SITES (population) MONTANA	Plentywood 2400	Ryegate 258	Scobey 1700
I. Present Television Reception A. Channel No., Call Letters-city (affiliate: A-ABC C-CBS N-NBC I-independent)	Ch.2 CKCK Regina (CTV) Ch.8 KUMV Williston (N,A) Ch.11 KXMD Williston (C,A)	Ch.2-KTVQ Billings (C,N) Ch.8-KULR Billings (A,N,C)	Ch.2 CKCK Regina (CTV) Ch.8 KUMV Williston (N,A) Ch.11 KXMD Williston (C,A) CH.13 CBKFT Regina (CBC)
B. quality of signals 3-good 2-fair 1-poor	2 - all channels	2 - all channels	2 - all channels
C. reception by: (1) T-translator C-cable; O-other (2) Translator (output) channels (3) Power (watts)	Translator - all channels 13 ? ? power not given	Translator - all channels 12 6 1W all channels	Translator - all channels 6 13 3 10 ? 5W 5W ?
D. nearest public TV station: (1) Ch. No. Call letters-city (2) Distance(miles)direction	Ch.9-KBHE Rapid City, SD 320 miles SSE	Ch.10-KBGL Pocatello, ID 280 miles SSW	Ch.9-KBHE Rapid City, SD 320 miles SSE
II. Suggested Receive System A. type (E-earth station MT-mini-transmitter T-translator C-cable)	E (cable headend)	E/MT (present translator site)	E/MT (present translator site)
B. suggested location	7 miles south of town.	Directly above & overlooking town on N.side rim rock.	3 mls E of town
C. area to be covered	2 sq. mls.	1/16 sq. mile	2 sq miles
D. suggested power (watts)[1]	10 VHF	10 VHF	100 UHF
E. restrictions (other than dollars or terrain)	None noted	None noted	Frequency must be checked with Canadian Border Patrol
F. estimated cost[2]	$27,850 - $33,420	$36,860 - $44,232	$47,080 - $56,496
Local Origination A. interest (3-hi, 2 med, 1 lo, 0 no)	0	0	0
B. proposed location	N/A	N/A	N/A
C. equipment available	Yes	No	No
Community Interest and Support A. interest in receiving PTV	1	3	1
B. willingness to provide support (3-high, 2-med, 1-low, 0-no) *community indicated certain limitations may apply	1	3*	3

1. In all cases effective radiated power (ERP) will be greater than transmitter power, depending on transmitter antenna gain.
2. Does not include real estate costs, equipment shelter costs, power service and consumption.

TABULAR SUMMARY OF SURVEY TEAM REPORTS

SURVEY SITES (population) MONTANA	WIBAUX 644	BROWNING 1823	WHITE SULPHUR SP[illegible] 1300
I. Present Television Reception A. Channel No., Call Letters-city (affiliate: A-ABC C-CBS N-NBC I-independent)	Ch.2-KDIX Dickenson (C,A) Ch.5-KXGN Glendive (C,N) Ch.8-KUMV Williston (N,A) Ch.11-KXMD Williston (C,A)	Ch.3-KRTV Gt.Falls (N,C) Ch.5-KFBB Gt.Falls (A,N,C) Ch.6-CHAT Medicine Hat (CBC)	Ch.3-KRTV Gt.Fall Ch.4-KXLF Butte (Ch.5-KFBB Gt.Fall Ch.6-KTVM Butte (
B. quality of signals 3-good 2-fair 1-poor	3 - all channels	1 - all channels	3 - all channels
C. reception by: (1) T-translator C-cable; O-other (2) Translator (output) channels (3) Power (watts)	Cable - all channels (cable output channel same as input channel) N/A	Translator-all channels No translator channels given No power given	Translator-all ch 13 11 9 7 10W - all channel
D. nearest public TV station: (1) Ch. No. Call letters-city (2) Distance(miles)direction	Ch.9-KBHE Rapid City, SD 210 miles SSE	Ch.7-KSPS Spokane, WA 210 miles WSW Ch.12-KUID, Moscow, ID	Ch.10-KBGL Pocate. 260 miles SSW Ch.12-KUID Moscow,
II. Suggested Receive System A. type (E-earth station MT-mini-transmitter T-translator C-cable)	E (Present cable head-end)	E/MT (Present translator site)	E (to feed existing translator)
B. suggested location	West edge of town	12 mls N. of town	4 mls ESE of town 1300 ft. above town
C. area to be covered	1 sq. mile plus	50 sq.mls.Indian Reserv. Prefers multi-town recep.	¼ sq.ml + Prefers [illegible] town reception)
D. suggested power (watts)[1]	N/A	10 VHF	10 VHF
E. restrictions (other than dollars or terrain)	None noted	None noted	None noted
F. estimated cost[2]	\$27,850 - \$33,420	\$36,860 - \$44,232	\$27,850 - \$33,420
III. Local Origination A. interest (3-hi, 2-med, 1-lo, 0-no)	0	2	1
B. proposed location	N/A	School	School
C. equipment available	No	Yes	Yes
IV. Community Interest and Support A. interest in receiving PTV	3	3*	3*
B. willingness to provide support (3-high, 2-med, 1-low, 0-no) *community indicated certain limitations may apply	3	3*	3*

1. *In all cases effective radiated power (ERP) will be greater than transmitter power, depending on transmitter antenna gain.*
2. *Does not include real estate costs, equipment shelter costs, power service and consumption.*

TABULAR SUMMARY OF SURVEY TEAM REPORTS

SURVEY SITES (population) MONTANA	Virginia City 150 (winter) 180 (summer)	Thompson Falls 1400	Ft. Benton 1851
I. Present Television Reception A. Channel No., Call Letters-city (affiliate: A-ABC C-CBS N-NBC I-independent)	Ch.4-KXLF Butte, (A,C) Ch.6-KTVM Butte (N,C)	Ch.2-KREM Spokane (C) Ch.4-KXLY Spokane (A) Ch.6-KHQ Spokane (N)	Site Visit Cancelled
B. quality of signal 3-good 2-fair 1-poor	1 - all channels	3 - all channels	
C. reception by: (1) T-translator C-cable; O-other (2) Translator (output) channels (3) Power (watts)	Translator - all channels 7 10 1W - all channels	Translator-all channels 6 4 2 10W all channels	
D. nearest public TV station: (1) Ch. No. Call letters-city (2) Distance(miles) direction	Ch.10-KBGL Pocatello, ID 170 mls SSW	Ch.7-KSPS Spokane 80-90 mls W	
II. Suggested Receive System A. type (E-earth station MI-microwave from other T-translator C-cable)	[illegible] MI (present translator site)	T	
B. suggested location	west-southwest of town.	Clarks Mountain-5 mls So of Town on mt.top w/elevation gain of 2800'	
C. area to be covered	3/4 sq.ml + Want to cover large area to reduce costs	2 sq.mls plus 7	
D. suggested power (watts)[1]	10 watt VHF	10W VHF-100 UHF (Prefer multi-town reception)	
E. restrictions (other than dollars or terrain)	None	None	
F. estimated cost[2]	$36,860 - $44,232	$17,790 - $21,354	
III. Local Origination A. interest (3-hi, 2-med, 1-lo, 0-no)	1	1	
B. proposed location	Library	School	
C. equipment available	No	Yes	
IV. Community Interest and Support A. interest in receiving PTV	3*	2	
B. willingness to provide support (3-high, 2-med, 1-low, 0-no) *community indicated certain limitations may apply	3*	2	

1. *In all cases effective radiated power (ERP) will be greater than transmitter power, depending on transmitting antenna gain.*
2. *Does not include [illegible] costs, power service and connection.*

Chart I. COMMUNITY BACKGROUND INFORMATION

Ref. No	Item	Wartburg, Tenn (Morgan Co)	Nora, Va (Dickenson Co)	Highlands N C (Macon Co)	Andrews, N C (Cherokee Co)	Sylva N C (Jackson Co)	McConnelsburg Pa (Fulton Co)	Dillard Ga (Rabun Co)
1	Population	15 1800	1300	583	[illegible] 1500	1600	1,200	[illegible]
2	Major employer Economic bases most common jobs	Coal mining farming timber Red Cap shirt factory label factory	Lambert Coal Co	Tourism construction	Textile & woodworking industry Baker Mfg	Civil service textile W Car Univ, SW N C State Gov Dept of Trans	[illegible]	[illegible] Mill
3	Unemployment	High	[illegible]	No problem	High	[illegible]	High	
4	Recreation facilities	High School teams hunting fishing swimming tennis	High School teams tennis	Movie (summer) High School teams tennis	High School football hunting fishing camping	2 movie theatres school pool [illegible] football	Movie theatre bowling [illegible] golf swimming	[illegible]
5	Active community groups	Jaycees Lions		Rotary Jaycees [illegible]	Rescue Squad Lions Masons	Rotary [illegible] Church	VFW [illegible] church	[illegible]
6	Local newspapers	2 weeklies	None	1 weekly	1 weekly	1 weekly Sylva Herald	[illegible] weekly	None
7	Other newspapers	Knoxville Journal Knoxville News Sentinel	Cumberland Times Bristol Herald	Atlanta Journal	Asheville Citizen	Asheville Citizen	[illegible]	
8	News Sources							
	Local	Newspaper radio	Radio	Newspaper	Newspaper radio	Newspaper radio	Newspaper	Newspaper
	Regional	TV	TV	Newspaper TV	Newspaper TV	Newspaper TV	Newspaper & radio	Radio
	National	TV	TV	TV	TV	TV	TV	Radio & TV
	International	TV	TV	TV	TV	TV	TV	Radio & TV
9	Racial/ethnic composition	White Scotch Irish German English	White English	White English	White Scotch Irish English	White English Scotch Irish German	White	
10	Size of community	2 x 3/4 mi	3 mi	1 sq mi city limits	3 mi	3 mi radius	[illegible]	[illegible]
	Nearest							
11	Town over 25K	Oak Ridge 20 25 mi	Kingsport 70 80 mi	Asheville 80 mi	Asheville 100 mi	Asheville 46 mi	Chambersburg [illegible]	Anderson [illegible]
12	Town over 50K	Knoxville 45 mi	Roanoke 200 mi				Hagerstown 34 mi	Greenville 84 mi
13	Airport	17 mi	84 mi	80 mi	100 mi	46 mi	34 mi	
14	Post Office	In town	In town	In town	In town	In town	In town	In town
15	Hospital	Clinic in town Hospital 20 25 mi	28 mi	In town	In town	In town	In town	
16	Community	Union 6 mi	McClure 3 mi	Franklin 20 mi	Murphy 15 mi	Waynesville 20 mi	M[illegible] 9 mi	Rabun Gap [illegible]
17	Transportation capability	None	None	None	None	[illegible]	[illegible]	None
18	Climate	Comfortable	Harsh winter comfortable summer	Fairly harsh winter comfortable summer	Comfortable	Winter [illegible] summer comfortable	Comfortable	Fairly comfortable winter & summer
19	Impact of seasons	None	None	Impact on tourism	None	None	None	None

Ref. No	Item	Spencer Tenn (Van Buren Co)	Blackmont Ky (Bell Co)	Cubbage Ky (Bell Co)	Franklin W Va (Pendleton Co)	W Union W Va (Doddridge Co)	Cincinnatus, N Y (Cortland Co)
1	Population	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1100
2	Major employer Economic bases most common jobs	[illegible]	[illegible]	[illegible]	[illegible]	Consolidated Gas [illegible]	School system [illegible] factories
3	Unemployment	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 50 mi away
4	Recreation facilities	10 adult & child [illegible] 14 [illegible] ball teams	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] swimming tennis golf only H S [illegible]
5	Active community groups	Jaycees [illegible] active	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Local newspapers	None	None	[illegible]	[illegible]	[illegible] weekly	1 weekly [illegible]
7	Other newspapers	[illegible] McMinnville	Middlesboro [illegible]	[illegible]	[illegible]	[illegible]	Cortland [illegible]
8	News Sources						
	Local	Newspaper	Newspaper	[illegible]	[illegible]	[illegible]	Newspaper & radio
	Regional	Radio & TV	Newspaper & [illegible]	[illegible]	[illegible]	Newspaper radio & TV	Newspaper radio & TV
	National	TV	TV	[illegible]	[illegible]	TV & magazine	TV & magazines
	International	TV	TV	[illegible]	[illegible]	TV & magazine	TV & magazines
9	Racial/ethnic composition	White	White	[illegible]	[illegible]	White	White
10	Size of community	8 sq mi	[illegible]		[illegible]	[illegible]	1 mi x 10 mi of valley
	Nearest						
11	Town over 25K	[illegible] 56 mi			[illegible]	[illegible]	[illegible] 20 mi
12	Town over 50K	Chattanooga 65 mi	Knoxville 80 mi	[illegible]	[illegible]	[illegible]	[illegible] 50 mi
13	Airport	65 mi	80 mi	[illegible]	[illegible]	[illegible]	[illegible]
14	Post Office	In town	[illegible]	[illegible]	[illegible]	[illegible]	In town
15	Hospital	[illegible] mi	[illegible]	[illegible]	[illegible]	[illegible]	20 mi
16	Community	[illegible] mi	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 18 mi
17	Transportation capability	None	[illegible]	[illegible]	[illegible]	[illegible]	None
18	Climate	Fairly comfortable winter & summer	Fairly comfortable winter & [illegible]	[illegible]	[illegible]	[illegible] comfortable winter & summer	Fairly comfortable winter (snow) very comfortable summer
19	Impact of seasons	[illegible]	None	[illegible]	[illegible]	Very little	Important to planting and harvesting

Chart II. COMMUNITY EDUCATION INFORMATION

Ref. No.	Item	Wartburg, Tenn (Morgan Co.)	Nora, Va (Dickenson Co.)	Highlands, N C (Macon Co.)	Andrews N C (Cherokee Co.)	Sylva N C (Jackson Co.)	McConnelsburg, Pa (Fulton Co.)
20	SCHOOLS						
	Elementary Enrollment	500	540		525	950	600
	No. of teachers	25	30		23		30
	High School Enrollment	625	468	K 12 380	450	840	550
	No. of teachers	28	27	23	29		30
	Trade School Enrollment	Voc school 175	Voc school 400	AHC Voc [illegible] STI 40 mi		[illegible]	Tech [illegible] 22 mi
	Colleges Enrollment	Roane St Comm 3000 20 mi	Clinch Valley 1000 40 mi	W Carolina U 35 mi	Tri County Tech Sch & Career Coll [illegible]	Western Car U 6000	
21	VTR/TV sets	2 VTRs TV receivers	1 VTR TV receivers	No VTR 1 TV	No VTR (avail through college) TV receivers	VTRs TV receivers	No VTR 1 TV
22	Higher education	25-30%	25%	40%	27%	20%	20%
23	Which colleges attended	Roane State Tenn Tech	Clinch Valley S W Comm Mountain Valley	Western Chapel Hill St Andrews STI	Tri County Western Carolina Mars Hill	Western	Penn State Hagerstown Jr Shippensburg State
24	Availability of adult ed programs	Fed funded [illegible]	Colleges & vocational school	Through STI at school & in town	In town	Western STI Tri County	At school
25	Library	In town	Bookmobile (lib 11 mi)	In town	In town	In town	Closed
26	Book stores	20 [illegible]	40 mi	In town	15 mi	University	22 mi
27	Satisfaction with educational opportunities	Sufficient opportunities	Satisfied	Want more opportunities	Satisfied	Very satisfied	Satisfied

Ref. No.	Item	Dillard Ga (Raybun Co.)	Spencer Tenn (Van Buren Co.)	Blackmont Ky (Bell Co.)	Cubbage Ky (Bell Co.)	Franklin W Va (Pendleton Co.)	W Union W Va (Doddridge Co.)	Cincinnatus N Y (Cortland Co.)
20	SCHOOLS							
	Elementary Enrollment		400	28[illegible]	200	440	1130 [illegible]	[illegible]
	No. of teachers	12		[illegible]	6			[illegible] & [illegible]
	High School Enrollment	200 (priv) (160 pub) 11	[illegible]	[illegible]	1,100	[illegible]	518	[illegible]
	No. of teachers	13		[illegible]		[illegible]	110 [illegible]	
	Trade School Enrollment	0		[illegible]	1 [illegible]	[illegible]		[illegible]
	Colleges Enrollment	0	[illegible]	[illegible]				[illegible]
21	VTR/TV sets	1 VTR for 4 school	None		None	[illegible]	1 VTR 1 TV	VTRs [illegible] 3 [illegible] 1 [illegible] B W
22	Higher education	20% (15% [illegible])	15%	10%	25%	[illegible]	30% [illegible]	[illegible] voc)
23	Which colleges attended	State U Georgia Tech Piedmont	Tenn Tech	Cumberland Eastern Ky U of Ky Morehead State	Morehead Lincoln Mem U Cumberland Union	[illegible] W Va [illegible]	Fairmont State Salem Glenville State W Va U	[illegible] N Y [illegible]
24	Availability of adult ed programs	None	Discontinued (lack of interest)	None	None local 15 mi	None [illegible]	Through [illegible] school	[illegible] school
25	Library	None local Bookmobile 7 [illegible]	[illegible]	None local Bookmobile at Pineville	None local Bookmobile 13 mi	[illegible]	Yes [illegible]	
26	Book stores	7 mi Clayton	30 mi [illegible]ville	Middlesboro	13 mi Pineville	[illegible]	2[illegible] mi Clarksburg	[illegible]
27	Satisfaction with educational opportunities	Natives satisfied others not	Very satisfied	Fairly satisfied	Elem good but without [illegible] [illegible] satisfied	[illegible]	Very satisfied	[illegible] satisfied

Chart III. COUNTY DEMOGRAPHIC INFORMATION

County	Land Area Sq. Mi.	Total Pop.	EDUCATION (Persons enrolled in school) Elementary	High School	College	65 yrs. & over (%)	Total Labor Force	Median Income (1969)
Morgan, Tenn (Wartburg)	539	13,619	2,690	1,193	110	10.0	3,969	5,363
Dickenson, Va (Nora)	332	16,077	3,013	1,254	193	8.5	3,706	5,035
Macon, N.C. (Highlands)	513	15,788	2,221	1,175	98	14.3	5,811	5,654
Cherokee, N.C (Andrews)	452	16,330	2,474	1,141	71	12.0	5,977	5,660
Jackson, N.C (Sylva)	491	21,593	2,931	1,254	3,103	9.3	7,809	5,933
Fulton, Pa (McConnelsburg)	435	10,776	1,922	764	58	10.7	4,201	6,882
Raybun, Ga (Dillard)	368	8,362	1,114	574	10	12.0	3,416	6,056
Van Buren, Tenn (Spencer)	254	3,758	612	287	-	10.4	1,562	6,014
Bell, Ky (Cubbage & Blackmont)	370	31,087	5,576	2,027	165	12.0	8,254	4,444
Pendelton, W. Va (Franklin)	695	7,031	1,047	485	7	14.6	2,207	5,358
Doddridge, W. Va (W. Union)	319	6,389	1,005	405	25	16.5	1,904	5,892
Cortland, N.Y.	502	45,894	8,169	3,267	3,416	10.1	18,397	9,142

Chart IV. RADIO, COMMERCIAL TELEVISION AND PUBLIC TELEVISION CAPABILITIES

Ref No	Item	Wartburg, Tenn (Morgan Co	Nora, Va (Dickenson Co)	Highlands N C (Macon Co	Andrews N C (Cherokee Co)	Sylva, N C (Jackson Co)	McConnelsburg Pa (Fulton Co)
	RADIO						
28	Location & call letters	In town WECO	Clinchco Va 8 mi WDIC	Greenville S C 80 mi WFBC	Murphy N C 15 mi WCVP WKRK	In town WRGC (Univ) WWCU	In town WVFC
	COMMERCIAL TV						
29	Distribution	Direct & translator	Direct	Direct & translator	Direct & translator	Direct & translator	Cable & direct
30	No. of channels	2 or 3	2	3	up to 7	3 5	2 8 without cable 12 + UHF w/cable
31	Location & call letters	Knoxville WBIR Knoxville WATE	Bristol WCYB Johnson City WJHL	Greenville WFBC Spartanburg WSPA Asheville WLOS	Chattanooga WRCB Knoxville WBIR Greenville WFBC Asheville WLOS	Asheville WLOS Spartanburg WSPA Greenville WFBC	Baltimore WBAL Harrisonburg WSVA Clearfield WPSX Washington D C WRC WTTA
32	Program satisfaction	Fairly satisfied	People offended by violence language etc	Not satisfied	Fairly satisfied	Not satisfied	Satisfied
	PUBLIC TV						
33	Distribution	Direct	Direct	Direct	Direct & translator	Direct & translator	Direct & cable
34	Location & call letters	Sneedville Tenn WSJK	Norton Va WSVN	Athens Ga WGTV	Chapel Hill N C WUNC Sneedville Tenn WSJK	Chapel Hill N C WUNC Sneedville Tenn WSJK	Hershey WITF Baltimore WMPB
35	Programming reception/grade of signal	Grade 4 Reception varies widely	Reception varies widely	All ranges most don't have PBS reception	Reception varies from no reception to good	Depending on location grade 4 5	Reception varies Cable goes out
36	Interest in PBS	Schools want for state ETV programs	Schools want PBS	Schools want PBS	Schools want PBS	Very interested	School & community interested school not using cable

Ref No	Item	Dillard Ga (Raybun Co)	Spencer, Tenn (Van Buren Co)	Blackmont, Ky (Bell Co)	Cubbage, Ky (Bell Co)	Franklin W Va (Pendelton Co)	W Union, W Va (Doddridge Co)	Cincinnatus N Y (Cortland Co)
	RADIO							
28	Location & call letters	None	None local Sparta 13 mi McMinnville 21 mi Cookeville 30 mi	None local	None local Pineville 20 mi Middlesboro 15 mi	None local Harrisonburg 35 mi WSVA Moorefield 42 mi WELV	None in county Clarksburg 27 mi WBNA WBOY WPDX	None local Cortland 20 mi WKRT WNOZ Syracuse 50 mi WSYR WFTM WNDR
	COMMERCIAL TV							
29	Distribution	Direct & translator	All direct	Cable	Direct	Cable	Cable	Direct
30	No. of channels	3	10	4 6	2 4	4	4	3
31	Location & call letters	Greenville Atlanta Spartanburg	Nashville Chattanooga Knoxville	Knoxville Asheville Lexington Gainesville	Gainesville	Roanoke WSLS Roanoke WDBJ Weston WDTV Harrisonburg WHSV		Syracuse WSYR WTVH Binghamton W[illegible]
32	Program satisfaction	Fairly satisfied [illegible] & drama		Fairly satisfied	Not at all satisfied with either reception or programming	Quite disturbed by crime violence esp rural areas	Fairly satisfied	[illegible]
	PUBLIC TV							
33	Distribution	None	Direct	None	Some reception from Sneedville	Cable	Direct to cable	Direct
34	Location & call letters		Nashville WDCN			Morgantown Keyser Franklin		Syracuse WCNY Binghamton WS[illegible]
35	Programming reception/grade of signal		Grade 2 on plateau none in valleys	Cable operator unwilling to add PTV into cable	Poor to nonexistent	Poor to nonexistent	Fair in cable None in remainder of county	Poor to none (Not graded)
36	Interest in PBS	Yes needs met	Yes needs met but timing of public affairs is bad	Yes not viewed but printed material seems okay	Interested in PBS not firsthand experience	Yes needs met	Yes needs met	Yes needs met

Chart V. FINANCIAL AND TECHNOLOGICAL REQUIREMENTS

Ref No	Item	Wartburg, Tenn. (Morgan Co.)	Nora, Va (Dickenson Co.)	Highlands, N.C. (Macon Co.)	Andrews, N.C. (Cherokee Co.)	Sylva, N.C. (Jackson Co.)	McConnelsburg, Pa (Fulton Co.)	Dillard, Ga (Raybun Co.)	Spencer, Tenn (Van Buren Co.)	Blackmont Ky (Bell Co.)	Cubbage, Ky (Bell Co.)	Franklin W Va (Pendelton Co.)	W Union W Va (Doddridge Co.)	Cincinnatus, N.Y. (Cortland Co.)
37	Possible Constraints in Founding or Improving Public Television	Terrain, economic	Terrain Economic	Terrain community interest	Terrain economic	Terrain economic	Terrain economic	Terrain economic population density	Terrain economic population density	Terrain economic population density	Terrain economic population density	RF Quiet Zone terrain economic population density	Terrain economic	Terrain economic
	CABLE SYSTEM													
38	Head End Location	None (in negotiations now) (Closest cable is 17 miles)	None	None	None	None	Yes mountaintop east of town	None (except Clayton 7 miles)	None	Yes [illegible] does not carry ETV [illegible]	None	Yes Cable reception is poor PBS virtually blocked out Adjacent to town	W. Union out, (2) nearby	None
39	Ownership						Tri-State Cable TV			West End Cable Co (Charlie Jackson lives within County)		Woodrow Hartman (local in Franklin)	West Union Cable Co Eugene Stewart (lives elsewhere)	
40	Vintage						Unknown — being updated			Old cheap home brew		1972		
41	Condition						Poor to fair being updated			[illegible]		Improving but not fully recovered from winter of 1978	Fair to poor	
42	Capacity						12					12	12	
43	Originators/ How Imported						Baltimore Md D.C. Hagerstown Md Lancaster Pa Altoona Pa (direct off air)					Off air Harrisonburg Va Roanoke Va Clarksburg W Va	Off air	
44	Penetration						80% (600+ subscribers)					95% (per Fact Book)	80% (per Fact Book)	
45	Installation/ Subscription/ Billing						$15 $5.00 monthly or annually					$10/$6/monthly (per Fact Book)	$10 $6 monthly coupons	
	PROPOSED SMALL EARTH STATION	Not required	Not required	Not required	Not required	Yes	Not required	Not required	Not required	Not required	Not required	Ideal situation with PBS stations prohibited from sending suitably strong signal	Not required	Not required
46	Location general					Southwestern Technical Institute Campus						In town		
47	Existing Distribution System					None								
48	Proposed Distribution System					Mini transmitter						See community recommendation		
49	PROPOSED TRANSMISSION SITE (TYPE)	Translator	Mini transmitter or translator	Translator (being installed) Mini transmitter desired	PBS Translator exists	Mini transmitter with (2) separate one hop microwave inputs plus translator and PBS satellite and translator input	Mini transmitter	Mini transmitter	Mini transmitter	Translator	Translator(s) or cable extension	None permitted	(11) translators	Translator
50	Coverage Objective(s)	#1 County #2 Wartburg Proper #3 Wartburg plus	Town and surrounding 1½ mile radius	Town and surrounding area 1 sq mi plus 2 mi radius	(See recommendations section)	8 x 3 miles [illegible] Sylva	McConnellsburg	Dillard & surrounding area Assymetrical Star 1.5 N x 2.05 x 1.7 E x 3.0 mi W (Really want total County coverage)	#1 choice is whole County (20 x 20 mi) #2 more people over the hill 1.6 x 6.5 mi N-S from water tower at SSW from TV shop	3 mile radius	2 miles into community		Each of (11) County schools and whatever else gets covered	3 x 10 mi swath

Chart V. FINANCIAL AND TECHNOLOGICAL REQUIREMENTS — Continued

Ref. No.	Item	Wartburg, Tenn. (Morgan Co.)	Nora, Va. (Dickenson Co.)	Highlands, N.C. (Macon Co.)	Andrews, N.C. (Cherokee Co.)	Sylva, N.C. (Jackson Co.)	McConnelsburg, Pa (Fulton Co.)	Dillard, Ga (Raybun Co.)	Spencer, Tenn (Van Buren Co.)	Blackmont, Ky (Bell Co.)	Cubbage, Ky (Bell Co.)	Franklin, W. Va (Pendelton Co.)	W. Union, W. Va. (Doddridge Co.)	Cincinnatus, N (Cortland Co.)
51	Transmitter Power and Type	#1 Many 100 watt UHF translators #2 (1) 100 watt UHF translator on Pilot Mt 6 mi NW of town #3 Add (1) 100 watt UHF translator to Communications Tower in Frozen Head State Park	100 watt UHF directional	100 watt UHF being installed		100 watt UHF directional	100 watt UHF directional	100 watts directional UHF	100 watts directional – UHF	(1) or possibly (2) 100 watt directional UHF	100 watt directional UHF (several)		Schools alone possibly 1 watt UHF. Schools with surrounding pop. possibly 100 watt UHF	100 watt UHF directional
52	Location General	Answered in Ref No 51	Hill between elementary & high school	(2) mountaintops being studied		Kings Mountain	Mountain at Knobsville	Hill opposite Gulf Station	(1) atop 128 water tower center of town (2) Behind TV shop	Not specified Many hills surround the area	Not specified Many hills surround the area		Use nearby hill for each school	Hill west of 3 x 10 mi swath
53	Prime Power Availability	#1 None #2 Yes #3 Yes	None	Yes		Yes	Yes within 1 mile	None exists close by	Exists at both sites	None exist	None exist		To be provided	None existing
54	Source	State	Not determined	City Power		Jackson County	West Penn Power	Georgia Power	Caney Fork Electric		Monongahela Power Co		Monongahela Power Co	Niagra - Moh. Power Co
55	Accessibility	All year round	Not determined (no accessibility now)	Yes, year round		year round	year round	4 wheel drive summer on foot some of winter	All year	Not determined	Not determined		To be determined	To be determin
56	Legal Restrictions	Non known	Owned by Chnchfield Coal Co	1 privately owned 1 state owned		None	None	Privately owned but no problems expected	#1 None #2 Has been cleared with owner	General Problem People not issuing leases for mountaintops which have any possibility of being strip mined. Cable operator threatens to challenge in court	General Problem People not issued leases for mountaintops with any strip mining possibility	Not allowed	None known	None expected
57	Environmental Restrictions	None	None	None		None	None	None	None	None	None		None known	None known
58	Air Space Restrictions	None	None	None		None	None	None	None	None	None		None	None
59	Signal Interference	None expected	None	None		None	None	None expected	None expected	None expected	None expected		None expected	None expected
60	Operator	City personnel	Not determined	State mother station UNC TV		Southwestern Tech & Western Carolina Univ	School system	Foxfire Program and/or Clayton High School	School system	Open problem since cable operator is hostile and no technical expertise seems to exist locally	None identified Al Brock possible since Brock owns cable which comes within 2 miles		Not designated perhaps cable operator	Propose mother station operate and maintain
61	Maintenance	City personnel	Not determined	State mother station UNC TV		Southwestern Tech Engineering	School system	Charles Pennington Cable operator in Clayton	Joe Rogers (TV service)					
	PROPOSED LOCAL ORIGINATION													
62	Interest	None	Schools Interested	Schools Interested	None	High	Schools and mayor	High based upon experiences of Clayton (7 miles)	High	None	None	Schools interested	None	None
63	Limitations		Difficult to organize community	Problem with local support		Economic & equipment	Economic	All operations probably from outside Dillard	None known			None cited		
64	Locations		Would require capital improvement to school	School building		Southwestern Tech for studio Western Carolina Univ for studio	School buildings	Schools and mini transmitter site	Elem. school or college in new shelter			School and new shelter		

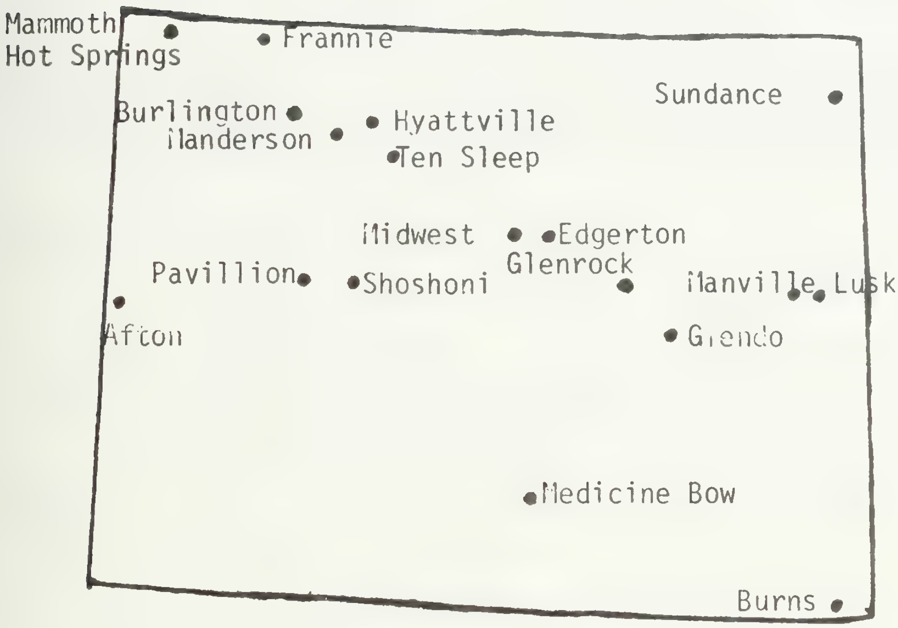
Chart V. FINANCIAL AND TECHNOLOGICAL REQUIREMENTS — Continued

Ref No	Item	Wartburg, Tenn (Morgan Co)	Nora Va (Dickenson Co)	Highlands, N C (Macon Co)	Andrews, N C (Cherokee Co)	Sylva, N C (Jackson Co)	McConnelsburg, Pa (Fulton Co)	Dillard, Ga (Raybun Co)	Spencer Tenn (Van Buren Co)	Blackmont Ky (Bell Co)	Cubbage, Ky (Bell Co)	Franklin, W Va (Pendelton Co)	W Union, W Va (Doddridge Co)	Cincinnatus, N Y (Cortland Co)
	FINANCIAL ARRANGEMENTS — Construction Costs													
65	Extend distribution	$17 644	$19 230	$ [illegible] 440		$17 644	$19 230	$19 230	(2nd choice) $19 230	(For each) $17 644	(For each) $17 644	(1) [illegible] $27 850	$194 084	$17 644
66	Local Origination		$14 628	$11 000		$27 809 (Exclusive of existing local origination equipment)	$ 5 000	$ 6 588	$13 588			$13 588		
67	Subtotal	$17 644	$33 858	$1[illegible] 440		$45 453	$24 230	$25 818	$32 818	$17 644	$17 644	$41 438	$194 084	$17 644
	MAINTENANCE AND OPERATIONS — ANNUAL													
68	Extend distribution	$ 1 042	$ 1 135	$ 93		$ 1 042	$ 1 135	$ 1 135	$ 1 135	$ 1 042	$ 1 042	$ 1 250	$ 11 468	$ 1 042
69	Local Origination		$ 950	$ 715		$ 4 552 (Exclusive of existing local origination equipment)	$ 325	$ 428	$ 883			$ 883		
70	Sub Total (See Appendix for details)	$ 1 042	$ 2 085	$ 808		$ 5 594	$ 1 460	$ 1 563	$ 2 018	$ 1 042	$ 1 042	$ 2 133	$ 11 468	$ 1 042
	COMMUNITY SUPPORT													
71	Estimate of Extent	Probably can raise $10 000	Possibly none from community	May get some community support		$20 000	Could possibly raise some funds	Probably could not raise any money	Possibly, if drive and city grants could get $5 000 together	A few hundred dollars — maybe	Less than $5 000	Town and county could possibly get $10 000 together	$25 000 absolute upper limit	$5 000 possibly
72	Method		Coal company possibly would underwrite	Promotion by community representatives		Funds raised on a County basis		Foxfire Program could operate & possibly fund maintenance once installed	Direct contribution	Solicitation by interested individuals	Solicitation by unnamed parties	Appropriation & solicitation	School budget alone	Probably could be educated for PTV improvement fund drive

SECTION 3

SITE SURVEY LOCATIONS

WYOMING



COMMENTS

- Only five of the 151 translator stations operating in Wyoming carry public television.
- Far west border, mid-state to upper northwest corner, is growing in public television reception through pay cable system. Examples of towns which are or will be receiving public television via pay cable are Big Piney, LaBarge, Pinedale and Dubois. However, Afton and Mammoth Hot Springs do not receive public television.
- West of Horn Mountains on the northern border there is little public television reception. Examples of towns not receiving public television are Frannie, Burlington, Manderson, Ten Sleep and Hyattville.
- Just north of central Wyoming there is a pocket of communities which receive minimal or no public television. Examples of towns receiving poor quality public television signals are Midwest and Edgerton. Linch and Kaycee receive no public television.
- Just north of the extreme southeast corner, some communities will receive public television in the near future. Although Manville and Lance Creek receive no public television, Lusk will shortly receive public television via pay cable, and Glendo via translator. Glenrock receives public television via local cable.

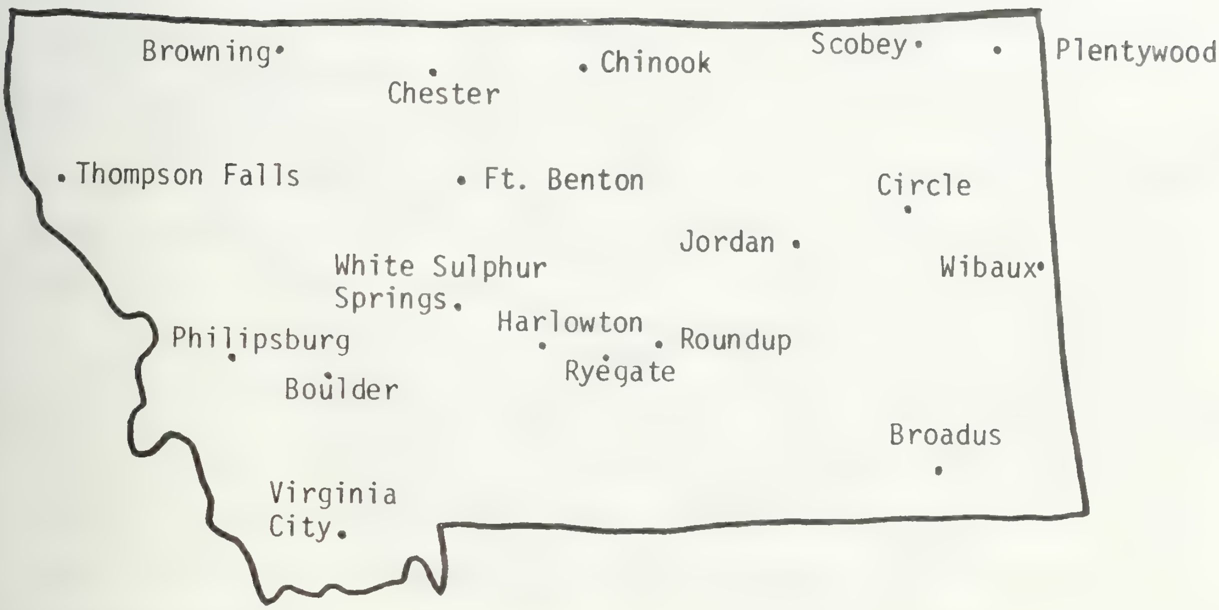
. Extreme southeast corner is generally receiving public television. LaGrange, Ft. Laramie and Albin receive public television via REA translator from KTNE, Alliance, Nebraska; Pine Bluffs and Guernsey via pay cable. Burns receives a minimal, poor quality public television signal, while Hawk Springs receives no public television.

. West of Laramie Mountains there is very little public television reception. Examples of towns not receiving public television are Rock River, Medicine Bow, McFadden and Shirley Basin.

SECTION 3

SITE SURVEY LOCATIONS

MONTANA



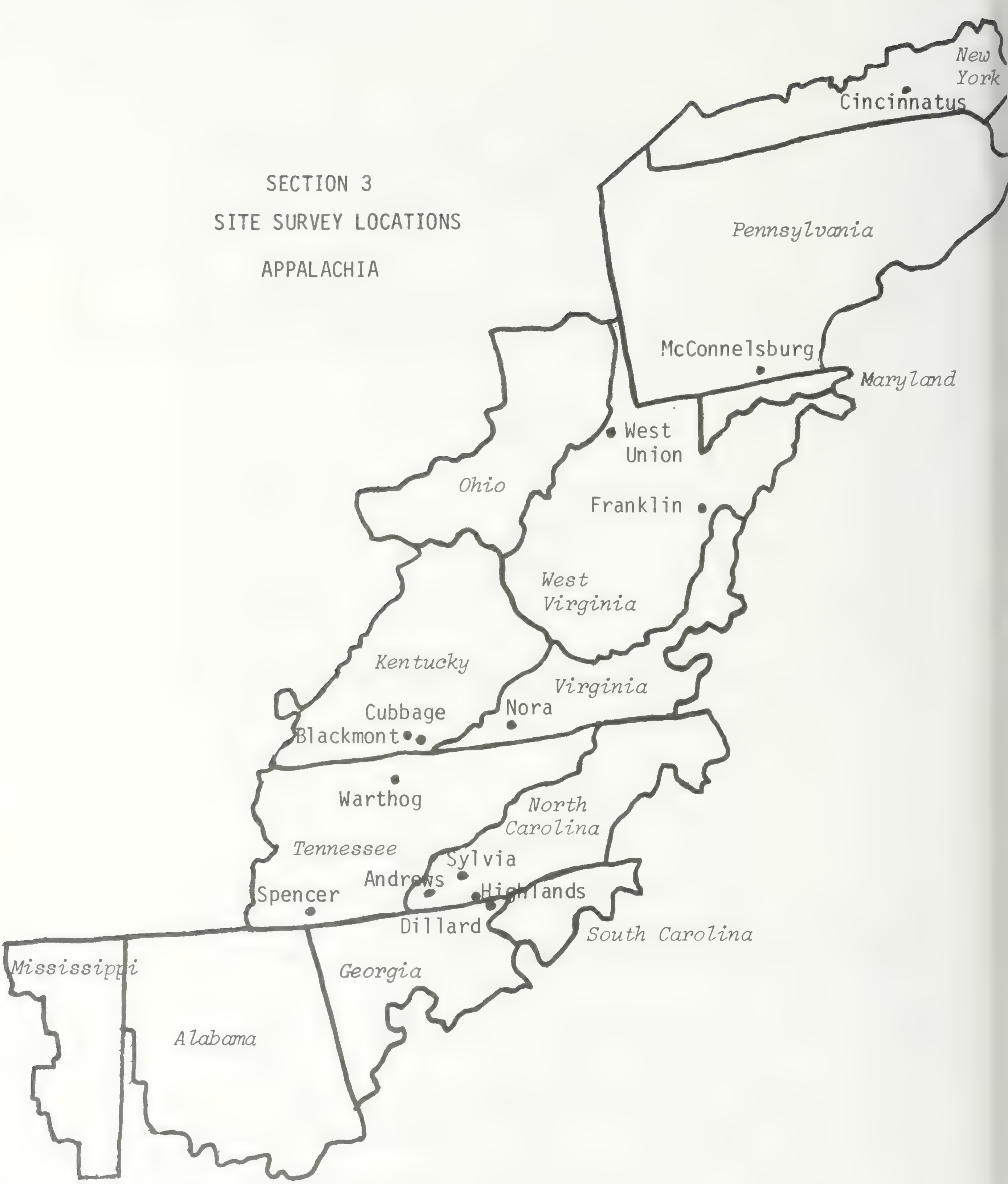
COMMENTS

- Only three of the 279 translator stations operating in Montana carry public television.
- Northwest corner of Montana (around Kalispell) receives KSPS-Spokane via cable.
- On the western border, central longitude (around Missoula) receives KSPS-Spokane via cable.
- A belt of communities from border to border in the southern part of Montana receive KUED-Salt Lake City via cable.
- Northern and central parts of Montana do <u>not</u> receive any public television signals.
- Extreme southwest and northeast corners of Montana do <u>not</u> receive any public television signals.

SECTION 3

SITE SURVEY LOCATIONS

APPALACHIA



COMMENTS

. Commercial and public broadcasting signals are readily available in most parts of Appalachia.

SECTION 4
TECHNICAL DETERMINATION

To assist in the determination of custom delivery options to provide public television service in rural communities, each survey team was required to become familiar with principles of television coverage, factors influencing television coverage, the use and interpretation of contour maps, VHF and UHF differences, head-end systems, transmit and receive facilities, local origination equipment, etc.

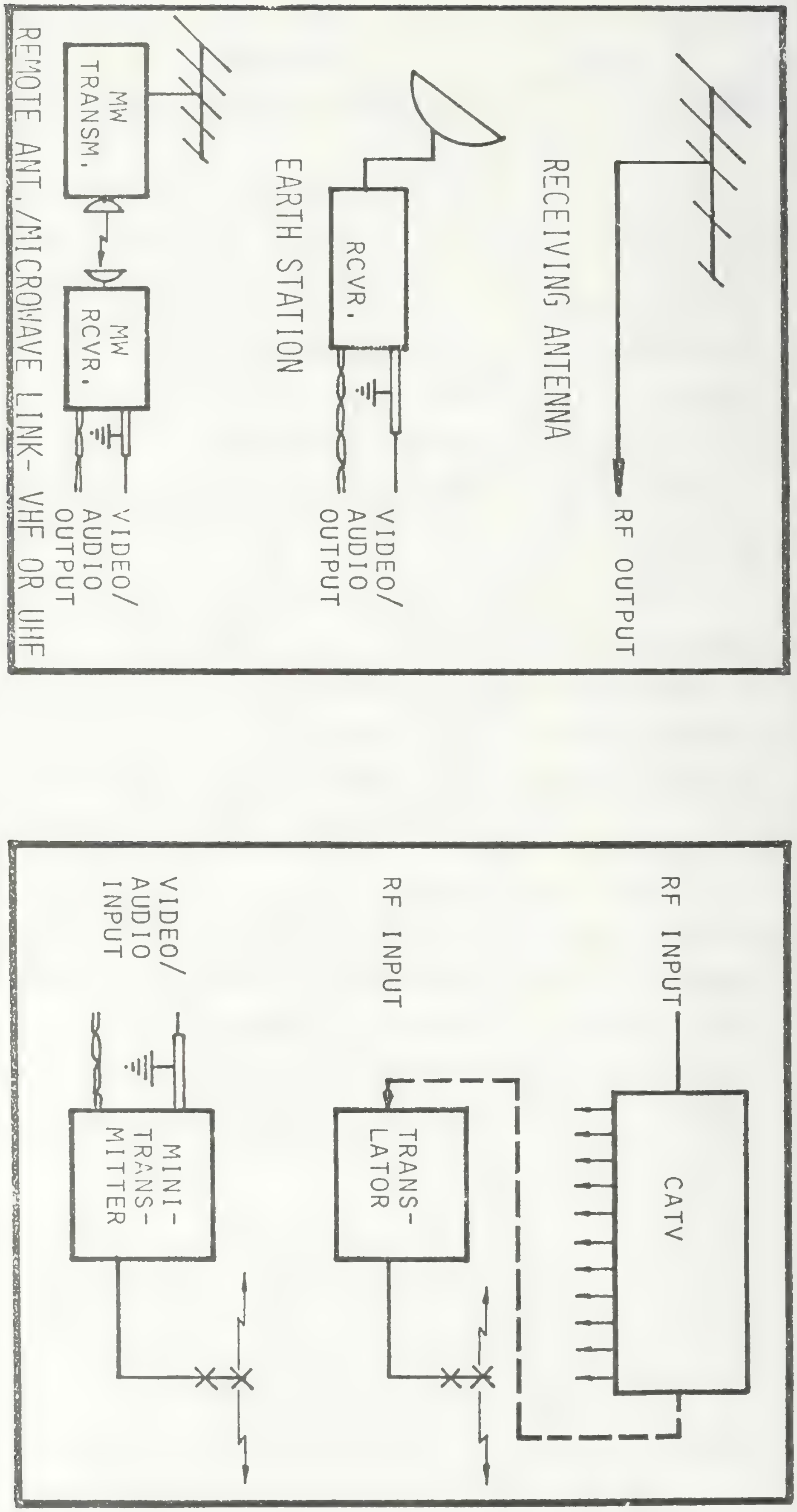
Each survey team was provided with a resource package which included guidelines and procedures for determining custom delivery requirements and the associated costs to enable rural communities to receive public television.

Site visit meetings were designed to stimulate discussions to determine the custom delivery option most consistent and expedient with the community's requirements and resources. The procedures and instrumentation assisted the survey team in comparing and contrasting technical systems, suggested installation sites, restrictions, estimated costs and other information to support survey team recommendations for a custom delivery option.

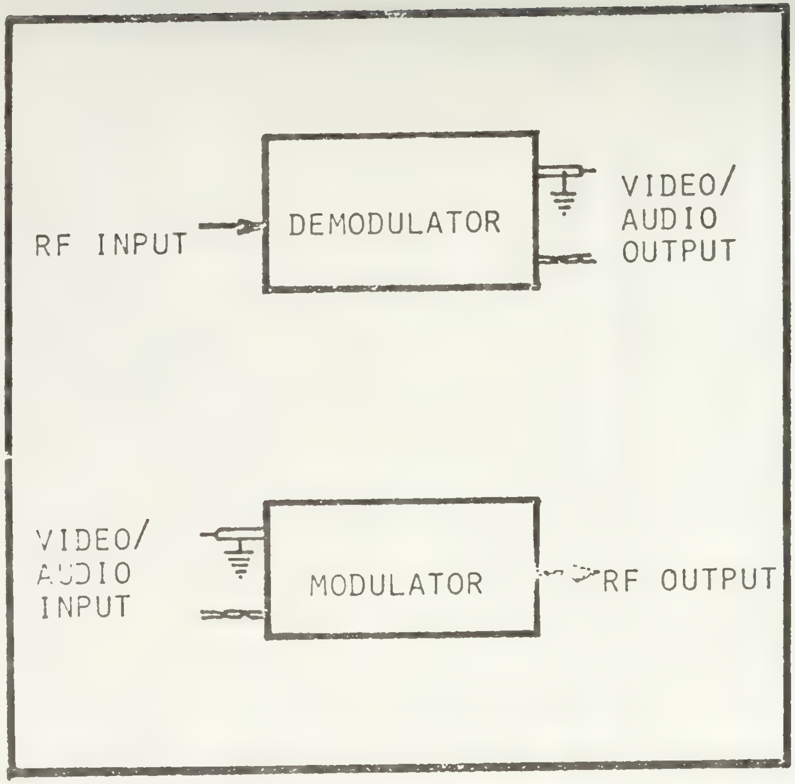
This information base was the outcome of the training session and field activities resulting in recommendations for each participating community. Several recommendations mentioned in the field survey suggested a hybrid system and are worth noting.

- Cable systems serving rural communities are often unable to economically justify distribution beyond the community because of low population density. Extending the signal beyond the cable system through the use of a translator is one possibility. It may, however, be in conflict with cross-ownership rules.
- The installation of a small earth station and mini-transmitter at a location that can serve a number of communities was also suggested in several of the community meetings. Specific mention was made of XL Heights, a location 8 miles west of Butte, Montana, which can broadcast to a number of communities in the region. Shared use of a 100 watt VHF mini-transmitter by six communities would realize economies and more efficient spectrum utilization, in contrast to six small earth stations and six 10 watt VHF mini-transmitters serving six individual communities in proximity to XL Heights.

The preceding charts and tables summarize the technical findings and survey activity for each community. The Training Manual, developed by PSSC, includes detailed materials used in the study.



DELIVERY OPTIONS



INTERFACE HARDWARE

1	RECEIVING ANTENNA	- CATV
2	RECEIVING ANTENNA	- TRANSLATOR
3	RECEIVING ANTENNA	- TRANSMITTER
4	EARTH STATION	- CATV
5	EARTH STATION	- TRANSLATOR
6	EARTH STATION	- TRANSMITTER
7	REM. ANT./MW LINK	- CATV
8	REM. ANT./MW LINK	- TRANSLATOR
9	REM. ANT./MW LINK	- TRANSMITTER
10	CATV	- TRANSLATOR

POSSIBLE COMBINATIONS

DELIVERY OPTIONS

SECTION 5

LOCAL ORIGINATION

A secondary purpose of the study was to determine community interest in originating local programs by establishing a low-cost production facility in proximity to the small earth station/mini-transmitter. Accordingly, materials were developed on technical and financial requirements for local origination. These materials, found in the Training Manual, were included in the training session for site survey personnel and were also discussed with each community surveyed.

A majority of communities surveyed, however, indicated little or no interest in local origination. This attitude was evident in responses to the survey questionnaire and was expressed by various community members in both individual and group meetings. While these findings may reflect a lack of resources (both economic and personnel) to commit to such an effort and lack of personnel with experience or expertise in using program production equipment, they perhaps represent a more realistic perception of needs and priorities relative to the use of television in rural communities. The concern expressed in most cases was to acquire public television service in the most practical and economical manner.

Suggested equipment and facilities and associated costs for local origination are found in the Training Manual.

SECTION 6

LEGISLATIVE AND REGULATORY HIGHLIGHTS

Rural Electrification Act.

The Rural Electrification Act of 1936 was originally enacted to provide a source of money at low interest rates for development of electrification facilities and service in rural areas. In 1949, an amendment was added to the Act to authorize the REA administrator to provide loans to rural telephone companies on the same basis as rural electric companies. No mention was made in the Act regarding the funding of CATV (Community Antenna Television) systems under the loan program until 1962 when it was amended to exclude CATV from the program.

Recently, the National Telephone Cooperative Association (NTCA) has proposed that the REA Act be amended to make REA funds available for construction and operation of CATV facilities. Two specific modifications proposed by NTCA are of interest to this project: (1) an amendment to include CATV in the definition of "telephone service" and (2) a modification to permit REA loans for CATV facilities to be made to telephone systems serving less than 30 subscribers per route mile including cities, towns and villages with populations of less than 50,000. These modifications are contained in a Bill which was introduced in the Senate by Senator John Melcher (D-Montana) and in the House by Representative Charles Rose (D-South Carolina).

The first REA loan for extending broadband services to a rural community has been granted to a telephone company in Footville, Wisconsin, that is going to offer cable television. However, the loan cannot be used for television broadcast service due to federal restrictions. Television facilities will be funded with a separate loan from a private bank.

Rural Development Act.

The Rural Development Act of 1972 was a major amendment to the Consolidated Farmers Home Administration Act of 1961. The Rural Development Act gives the Secretary of Agriculture the authority to make funds available for rural development projects of all kinds. This Act establishes a revolving fund, the Rural Development Insurance Fund, with

very broad authority to make guaranteed and insured loans available for a wide variety of rural projects including water treatment plants, volunteer fire departments and small private businesses.

Because of its extremely broad scope, it is possible that this revolving fund can be used to help finance rural CATV projects; in fact, funds available under the Act are currently being used for installation of a cable/microwave demonstration project in Trempealeau County, Wisconsin. However, it is highly doubtful that the insurance fund can be used to finance CATV development if such development is to be done in conjunction with rural telephone projects. At present, rural telephone is financed exclusively through the REA, not the Rural Development Act, and recent Congressional action makes it very clear that there is no intention of allowing this to be changed.

FCC Cross-Ownership Rule.

The historical basis for the ban on cross ownership of telephone companies and CATV systems relates to the poles and conduit space owned by telephone companies. By either denying the cable companies pole rentals and conduit space or by charging exorbitant fees for the rentals, the telephone companies could force CATV operators to the point where they would prefer to lease the system from the telephone company rather than build their own.

In 1968 the FCC determined that the construction of cable systems by common carriers represented an interstate common carrier activity, and that "construction by a telephone company for an affiliated CATV operator calls for careful scrutiny on the part of the Commission in order to insure against wasteful duplication or unnecessary construction." However, in 1968 the telephone carriers were still involved in CATV. In 1970, the FCC promulgated rules prohibiting the telephone companies from furnishing CATV distribution services through an affiliated CATV system within their own telephone operating territory. The carriers were required to discontinue providing CATV service directly or through an affiliated or related CATV system within four years. This rule, however, also provided for waiver of the restriction with show of good "cause."

In November 1976, the National Telephone Cooperative Association (NTCA) requested a general waiver of the colocation cross-ownership rule. The petition seeks a general waiver of the rules that prohibit television and other broadband communications facilities to be owned and operated by the telephone company in the rural areas. The petition states that the general waiver should apply to cooperatives and other telephone companies with less than 30 subscribers per mile for the purpose of providing community antenna and cable television facilities and services in any area of the United States not included within the boundaries of any incorporated or unincorporated city, village or borough having a population in excess of 50,000 inhabitants. The granting of this waiver at the present time would make nearly all of the telephone companies which are financed by REA eligible for this waiver and would affect over 860 telephone companies.

In December 1976, the United States Independent Telephone Association filed a Statement of Support for the NTCA position. The Office of Telecommunications Policy sent a letter to the chairman of the FCC in January 1977, which also supported, in principle, removal of the cross-ownership rule. It did not, however, endorse any changes in the method of financing such operations. Also in January, the National Cable Television Association (NCTA) filed comments on the NTCA petition. Although it supports NTCA efforts to serve rural areas, NCTA suggests that the current procedure for waivers be clarified rather than a general waiver procedure. NCTA suggests that the Commission adopt a definition based on those communities which could not be served by CATV. NCTA suggested 25 or fewer potential subscribers per route mile. It also suggested that in addition to population density criterion, the maximum number of subscribers which the petitioning telephone company might serve should be specified. The suggested maximum promoted by the telephone industry was 150,000 but NCTA prefers a more conservative estimate of 50,000 to 75,000 subscribers.

Cable-Translator Cross-Ownership Ban.

The FCC ban of co-ownership of cable and translators in the same community states: *"No cable television system (including all parties under*

common control) shall carry the signal of any television broadcast station if such system directly or indirectly owns, operates, controls, or has an interest in......a television translator station licensed to the community of such system."

The FCC justification for the ban specifically involving translators is contained in the Second Report and Order concluding Docket No.18397, which dealt principally with the broader issue of cable-broadcast station cross-ownership and which is also barred. The discussion regarding translators is confined to a single paragraph which states: *"We also believe that cross-ownership of a translator station and a CATV system serving the same community should be prohibited. In our case-by-case consideration of existing translator-CATV cross-ownerships, we have observed that such combinations are unlikely to yield the best translator service to the public. Here, too, exceptions will be considered upon a showing that in the absence of cross-ownership there would be no increase in broadcast or CATV service to the public."*

Concern over this rule arises principally from the fact that joint, cooperative use of cable systems in villages and translators in outlying, very low density rural areas can be an efficient means of serving a large, heterogeneous area such as a rural county. Hybrid systems of this type were hypothesized and studied by the Denver Research Institute in studies sponsored by OTP. Regional planning to upgrade television might, as suggested by DRI, involve a franchising authority granting a cable company the franchise to provide cable service (including interconnection of institutions to support a variety of social services) in relatively high density areas.

Local Origination.

In 1976 Congress passed legislation that would allow translator stations to originate limited programming. The legislation also allows certain translator stations to operate unattended. The National Association of Broadcasters (NAB) was able to secure language in the Committee reports that makes it clear that the FCC is not to allow translators to operate as broadcasters, and that the rules to govern program origination should be quite restrictive.

In April, 1977, NAB filed a letter supporting a request submitted by the Washington State Broadcasters Association for a ruling on the practice of some UHF translator stations of substituting locally originated commercial advertisements for those broadcast by their primary stations. The chief of the Broadcast Bureau responded that the Commission was making an inquiry as to whether or not this practice violated Commission rules or policies. As of June, 1978, the inquiry had not been completed.

FM Microwave Translator Feeds

In December, 1977, the FCC relaxed its rules to allow translator stations to retransmit television signals from any suitable source, including auxiliary microwave stations, common carrier microwave stations, and cable television relay stations (CARS). Translators remain subject to the FCC's eligibility and licensing requirements. Prior to this, translators had to depend primarily on off-the-air VHF and UHF television signals for programming. The new rules will allow better picture quality and will make possible more relay stations without signal quality degradation.

However, these changes require translator equipment modifications. The primary change in equipment design is the use of a modulator in place of the translator receiver; the result is a "modulated translator" which is fed with conventional video and audio input signals. Such a "modulated translator" is virtually identical with a very low-power transmitter, or mini-transmitter.

Actions/Decisions/Next Steps

If the rural public television system is to become operational, some modifications in FCC regulations will be required. They include:

1. A change in the licensing rules to provide for the operation of mini-transmitters in conjunction with small earth stations to provide public television coverage for small rural communities not served by public television stations. Such mini-transmitters associated with a small earth station could be licensed under rules similar to those which now apply to unattended translators.

2. A change in general waiver procedures for cable-translator co-ownership to allow hybrid systems approved by local franchising authorities to operate in rural areas.

? Situation as of 6-81?

SECTION 7
FUNDING POSSIBILITIES

Cost, of course, is the major factor in any developmental effort. The realization that outside support will be required to implement an operational plan for extending public television to rural America was the impetus for including suggested funding sources in this report. The funding sources were selected because they specifically addressed needs of rural communities. No attempt was made to exhaust possibilities. The intent was rather to provide, for discussion purposes, basic information on certain agencies whose mission includes the needs of rural communities. Four funding categories were discussed: Federal, Foundation, In-state and Other.

Federal

Educational Broadcast Facilities Program (Department of Health, Education and Welfare.)

This program could be a primary source of funding for public broadcasting facilities construction. It offers a method to extend public broadcasting service into rural areas and also helps to establish local service channels. The Facilities Act, proposed by the Administration in October 1977, would give unserved areas, including rural areas, first priority. The Act would also allow direct grants to non-profit groups. No longer would grants have to go through a public broadcasting licensee.

Rural Electrification Administration (Department of Agriculture.)

The current REA program in telecommunications is limited to telephone service but some CATV services and facilities used for educational purposes have been financed by REA. Proposals for amendment of the Rural Electrification Act of 1936 have been received, which would expand REA authorization to loans for expansion of communications facilities for rural communities, independent of the technology used. In 1978, legislation to provide for REA financing of broadband facilities was introduced in the Senate by John Melcher (D-Montana) and in the House by Representative Charles Rose (D-South Carolina).

Revenue Sharing Funds.

These funds, distributed to incorporated communities, could be available for funding a public television technical system provided that the town has no restriction on its own general revenue funds that would prohibit a similar expenditure. The category requirements on federal revenue sharing funds were removed on January 1, 1977.

National Telecommunications and Information Administration.

NTIA was established to assume certain telecommunications functions and responsibilities within the federal government. The focus of NTIA efforts will be information and policy making, although managing federal telecommunications resources, improving the application of telecommunications and information technology will also receive attention. The use of telecommunications to better serve rural communities has also been mentioned as a focal point for NTIA support and assistance. Although the first year NTIA budget was modest, funding prospects for subsequent years are encouraging for rural America.

Bureau of Indian Affairs (Department of the Interior).

The fact that several Indian reservations are located in Montana and Wyoming presents another opportunity to mobilize BIA resources to support public television facilities. Educational opportunities and social welfare improvement traditionally receive strong emphasis in BIA program support.

Farmers Home Administration (Department of Agriculture).

This is an important program that can be adapted or used to secure help for rural communications systems. FmHA has a variety of loans available, and application for them may be made at one of FmHA's county offices, generally located in county-seat towns. Among the loans that might apply to bringing in public television to a rural community are the rural industrialization loans, and community facility loans.

Small Business Administration.

This is another possible resource that can be employed for communications development in rural areas. SBA provides guaranteed, direct or lender participation loans to small business concerns to help them finance plant construction, expand or convert, and to acquire facilities, equipment, supplies or materials.

Economic Development Administration (Department of Commerce).

Another possibility for financial aid in communications development in rural communities is the EDA. The agency's prime function is the long-range economic development of areas with low family income problems and severe unemployment. It helps to develop public facilities and private enterprise to assist in creating new permanent jobs.

Federally Impacted Communities.

Additional sources for possible funding include: The Office of Human Development, Department of Health, Education and Welfare and Community Planning and Development, Department of Housing and Urban Development.

Foundations

Fortin Foundation of Montana. The foundation offers grants largely for hospitals and education.

Stock (Paul) Foundation. This Wyoming-based foundation primarily gives locally, with emphasis on civic development, youth agencies and higher education.

Goodstein Foundation. The foundation offers grants primarily in Colorado and Wyoming, for higher education and hospitals.

Benton (William) Foundation. This foundation has a limited number of grants for communication and media projects.

Mott (Charles Stewart) Foundation. The purpose of this foundation is to support community functions through grants for life-long learning and enrichment. Other activities include family stability, community renewal and better delivery of service. The foundation is a pioneer in the community education concept.

In-state

Translator Tax Districts (Montana).

Under present laws, these districts may be able to provide some funding toward earth station/mini transmitter costs. However, many of the translator taxing districts are presently taxing near or at the $16 per year limit. Because of this factor, funds from this source may be generally limited.

Optional County Tax (Wyoming).

The levying and use of the optional one percent county tax agreed upon by a certain percentage of the people within the county has, in the past, been a valuable source of revenue. Public television equipment and facilities might be financed through this means.

Other

Oil Companies.

In several communities surveyed, certain oil companies provided much of the economic base of the area. In such instances, the oil companies at the corporate level might be approached to assist in bringing in public television to improve living conditions and to provide entertainment as well as educational programs in towns where they had primary interests.

SECTION 8

CONCLUSIONS

1. The proliferation of cable and translator systems has extended commercial television signals to virtually all rural communities.

2. A number of isolated rural communities in Wyoming and Montana with populations under 2,500 do not yet receive public television.

3. In contrast, 11 of the 13 rural communities surveyed in Appalachia receive public television, but coverage is spotty and signal quality is poor.

4. Rural geographically isolated communities are interested in receiving public television.

5. Rural geographically isolated communities could benefit from public television, but exhibit a limited awareness of PBS programs.

6. Costs to extend public television using cable or translator to unserved areas in Montana and Wyoming are prohibitive in most cases.

7. An alternative delivery system that reflects the requirements and resources of unserved communities is desired.

8. New advances in small earth stations and mini-transmitters provide viable alternatives to extend public television to rural America.

9. Use of small earth stations in conjunction with existing cable systems can also extend public television to rural America.

10. Use of translators fed by existing cable systems can extend service to those areas which cannot be served economically by extending the cable system.

11. Rural isolated communities cannot absorb the total cost for improving or extending public television to their communities.

12. Technical and financial support from appropriate agencies will be required to enable unserved rural communities to receive a high quality public television signal.

13. A mechanism will be required to coordinate and manage the planning, development and delivery of public television to rural America.

14. Local origination capability does not appear to be a priority for most rural communities.

SECTION 9

RECOMMENDATIONS

CPB Related

1. CPB should convene a meeting of federal agencies which support programs and services in rural America to discuss the findings and recommendations of the study.
2. CPB should convene a meeting of local, state and regional agencies to discuss the findings and recommendations from the study and to develop strategies for the implementation of an operational plan to extend or improve public television to rural America.
3. To validate the findings from the study, CPB should fund a prototype implementation effort to include a minimum of ten small earth station/mini-transmitter units to extend public television to selected rural communities on an experimental authorization or rule waiver basis.
4. A meeting of federal and non-federal funding agencies should be convened to discuss cooperative funding efforts to support the delivery of services through telecommunications to rural America.
5. Agencies with a national base should be identified to coordinate and manage the implementation of an operational prototype plan.
6. An appropriate organization should be designated to examine and interpret technical, regulatory, programmatic and economic issues which could impede the operational plan for extending public television to rural communities and to suggest appropriate measures to overcome barriers in the implementation process.
7. Initiate rule-making procedures to regularize the use of small earth station/mini transmitter combinations.
8. CPB should develop an informational program to demonstrate how new advances in telecommunications can improve services or alleviate some of the problems of rural America.
9. CPB should develop an informational program to create an awareness and understanding of public broadcasting programs and services.

State/Regional/Federal

1. Plan and schedule a series of follow-up state/regional meetings to discuss implementation strategies for public television in rural communities in Wyoming, Montana and Appalachia.
2. Encourage the creation of a state telecommunication authority or commission to facilitate the establishment of a public broadcasting system in Montana and Wyoming which can assume responsibility for acquiring and distributing broadcast programs and services.

3. Examine enabling translator legislation in Montana to see if mini-translator/earth station systems can be supported within existing legislation as tax districts financed by public revenue.

4. If necessary, encourage the creation of separate enabling legislation to allow for mini-transmitter/earth station system tax districts.

5. Suggest to appropriate Wyoming agencies the creation of enabling legislation similar to that in Montana, enabling mini-translator/ earth station system tax districts to be formed and financed by public revenue.

6. Suggest that unserved rural communities affiliate with an appropriate public television station to facilitate the acquisition of public television programs and services.

7. Dedicate a number of designated broadcast hours for distribution of selected programs unique to rural communities.

8. Support pending and proposed legislation to finance and improve broadcasting services in rural America. (See Legislative and Regulatory Highlights.)

9. Petition the FCC to rule favorably on requests to remove restrictions, adopt more flexible regulations and new regulations dealing with the unique small earth station/mini transmitter combination, to facilitate broadcast service delivery to rural America. (See Legislative and Regulatory Highlights.)

<u>Technical</u>

1. Prepare suggestions for existing cable companies and translator associations in unserved communities,outlining requirements for accessing public television.

2. Where existing distribution systems cannot provide public television, encourage the use of small earth stations and mini-transmitters to extend public television service to rural America.

3. Plan and schedule detailed engineering surveys for unserved rural communities interested in receiving public television and able to support such an effort.

4. Encourage, as appropriate, public television access on a county-wide or multi-town basis, using any combination of small earth stations, mini-transmitters, cable, or translators, to realize economies of scale.

5. Coordinate arrangements for frequency searches to determine the availability of VHF and UHF channels which could be allocated for 100 watt or 1000 watt mini-transmitters or translators.

6. Arrange to drop back to 10 watt VHF mini-transmitters or consider the use of UHF in the event a frequency search fails to reveal available VHF channels which could be assigned to specific communities.

7. Avoid, whenever possible, the mixing of VHF and UHF systems in suggesting technical alternatives for accessing public television.

8. Colocate, when possible, any new PTV facilities at existing translator sites.

SECTION 10

IMPLEMENTATION PLAN

To facilitate the implementation of a prototype operational plan to extend public television to rural America, a series of steps have been identified. The procedures, findings and recommendations from this study should serve as the framework for implementing the prototype operational plan. Any implementation efforts will be contingent upon the availability of funds and FCC Rule Modifications to authorize the use of mini-transmitter/small earth stations. The suggested steps are to:

1. Mobilize funding sources.
2. Request FCC approval for experimental authorization or rule waiver to permit implementation.
3. Select communities with greater need for and interest in public television as identified in the study. When possible, locate clusters of unserved communities to realize economies of scale.
4. Collect, compile and review data on selected communities.
5. Refine preliminary recommendations on technical requirements and delivery systems.
6. Notify communities of preliminary recommendations and request indication of continued interest and support for public television.
7. Establish ongoing communication with appropriate broadcasting, regulatory,and other agencies.
8. Prepare letters of agreement between selected communities and management agency to formalize arrangements for detailed engineering survey.
9. Conduct detailed engineering survey.
10. Prepare recommendations resulting from the detailed engineering survey outlining requirements for technical systems, equipment and updated costs.
11. Submit results of the engineering survey to selected communities.
12. Finalize provisions and arrangements for procurement, installation, management and financing.
13. Finalize contractual arrangements for technical assistance and financing with communities electing to participate in the prototype operational plan.

14. Procure, install and test equipment for prototype operation.

15. Initiate procedures for training of site personnel to operate and maintain equipment.

16. Transfer focus of control from management agency to appropriate state/regional public broadcasting authorities responsible for establishing processes and procedures for ongoing instructional programming needs and funding.

17. Validate implementation plan procedures for subsequent utilization in providing public television to rural America.

SECTION 11

SUMMARY

The potential of communication satellites for public service has been the subject of much discussion for almost a decade. Unfortunately, the expectations of yesterday have not been realized. The technical systems projected for the mid-seventies did not materialize in affordable form, the prospects for generating completely adequate revenues to support the ambitious plans for public service users never developed, and a strong, monolithic leadership did not emerge.

The responsibility to serve rural communities is another issue. Although much has been accomplished through telecommunications technology, 1978 continues to find rural communities with less than adequate public broadcasting services.

In retrospect, the public service recognizes that private enterprise will not assume the responsibility for extending broadcast services to rural America. The profit-making potential is limited within the present regulatory framework. Similarly, if left to individual communities, little will occur. A simple explanation: economies of scale require orderly aggregation.

Why do rural communities continue to be underserved? It has been postulated that rural communities do not possess the economic or political base to foster needed programs and services. Accordingly, without the base of operations, advancement is difficult. It is evident that without national leadership and national policy, rural telecommunications will not come about.

The availability of technical systems is no longer an excuse. The costs for implementation are modest. Some agency, however, must assume the leadership role to develop a national base for a rural public broadcasting system. CPB has that opportunity.

APPENDIX A

STATE AND REGIONAL HIGHLIGHTS

Wyoming and Montana

Wyoming, the ninth largest state, encompasses almost 98,000 square miles and may be best known for Yellowstone National Park and the Teton Mountain Range. Rich in natural resources, the "equality" state is recognized for its mining, agriculture, and manufacturing products. Among these are natural gas, coal, iron ore and uranium, as well as cattle, wheat, beet sugar, flour, processed meats and wood products.

Montana, the nation's fourth largest state, includes over 147,000 square miles of land. Glacier National Park, the Custer Battlefield National Monument and a portion of the Continental Divide are all within its boundaries. The "treasure" state is endowed with natural resources in addition to millions of acres of range and cropland. Copper, timber, oil and natural gas as well as livestock, wheat, barley and hay are some of the state's prominent commodities.

Numerous comparisons may be made of Montana and Wyoming based on this study's survey sites and background research. With a population of 746,224, Montana has twice as many people within its borders as Wyoming with a population of 332,146. Montana also has a greater population density with 5.07 people per square mile than Wyoming with 3.39.

Montana, with 56 counties, has more than twice as many as Wyoming with 23. However, Wyoming with an average of 14,441 people per county has a greater average county population than Montana with 13,326.

Comparing educational systems, Montana with 614 school districts (579 operating) has six times as many districts as Wyoming with 90.

All of the Montana towns selected for the survey are incorporated with a mayoral system of government. Three Wyoming communities do not have mayors or a related government system.

The possibility of bringing in public television had been discussed prior to the survey in about one-half of the communities in the study. About one-fifth of the towns surveyed have television clubs or associations.

The Wyoming towns surveyed are primarily Anglo with only a scattering of minority representation. Browning, Montana, located on an Indian reservation, is the only site with significant minority representation.

Unemployment does not appear to be a major problem in most of the towns surveyed, although five of the Montana communities reported some unemployment. Ranching and/or agriculture provide major economic bases in all towns surveyed with mining and energy-related industries providing other employment opportunities.

All sites surveyed are small, ranging from one to four square miles in size, and most are isolated, being located 100 or more miles from the nearest city of 50,000 or more population.

Seasonal impact is rarely felt in Wyoming towns, while most Montana communities are affected to some degree by seasonal factors. Tourism and agriculture are the leading factors causing seasonal impact.

Recreational and entertainment options are limited in most towns surveyed. At least one-half of the survey sites had few, if any, sports and recreational facilities. Most communities, however, enjoy watching high school athletics. The reports indicate that most Montana and Wyoming towns are fairly satisfied with their leisure and recreational opportunities.

The schools are a focal point in all the communities. While Wyoming communities report that over 50 percent of their high school graduates continue their education at a college or university, less than 50 percent of Montana graduates continue their education beyond high school. Most Wyoming towns have at least one adult education course available in the community on a regular basis. Montana towns reported that adult education is available on a very limited basis. Overall, most towns are not satisfied or only fairly satisfied with the educational opportunities available to them.

All towns surveyed have a public library either in town or nearby. Library holdings were surprisingly large for the size of the communities.

Weekly newspapers are available in 16 of the Montana towns surveyed. Four Wyoming towns have a weekly paper and two have weekly pages in the newspaper of a larger town nearby. Good quality radio signals are received in all but one of the towns surveyed.

Appalachia

Appalachia, or the Appalachian Region, is a land of contrast. The region includes all or part of thirteen states: Alabama, Georgia, Kentucky, Maryland, Mississippi, Ohio, New York, North Carolina, Pennsylvania, South Carolina, Tennessee, Virginia, and West Virginia.

The Appalachian portion of these 13 states represent 397 counties and a population of 19,027,000. As a unit, the Appalachian states have a population density of 98 people per square mile and a population of 76,064,000.

The average land area for counties of the thirteen Appalachian sites is 405.4 square miles, with a range of 254 to 695. The population in these counties range from 6,389 to 45,895 with an average of 15,131.

The Appalachian Region is surrounded by mountains that hold a wealth of natural resources. Yet these mountains have, for years, formed a barrier between the Appalachian people and the culture beyond. The rugged terrain has held back both progress and efforts to help solve the area's problems.

Demographic and geographic characteristics impede the economic development of the Appalachian Region. Among these characteristics are inadequate transportation and communications systems, insufficient skills and lack of facilities for training and re-training the area's people. As a result, low economic opportunity levels cause a large outward migration of workers and their families, further reducing the demand for economic progress.

Coal mining, manufacturing and farming provide major employment bases. Most of the sites reported serious unemployment problems. The average labor force per county is 5,170 persons with an average median income of $5,495. The average number of citizens over 65 in these counties is 10.8 percent with a range of 8.5 to 16.5 percent.

Elementary school average attendance in these counties is 2,521; secondary school, 1,063; and college, 558. The biggest discrepancy among the towns is in college attendance. College students ranged from zero in Van Buren County, Tennessee, to 3,103 in Jackson County, North Carolina.

At least one elementary and one high school are located within six miles of the towns surveyed. Trade schools exist in four of the communities and are within commuting distance in four other towns. One town reported having a college located in town, and five others having a college within 40 miles.

Students who continue their education after high school range from 10 to 70 percent. Adult education courses are available in most towns. Libraries are also evident in the majority of communities. Overall, 11 of the communities expressed at least fair satisfaction with their educational opportunities.

Recreational activities in the towns tend to center around school athletic events, community-sponsored activities and outdoor sports.

While several of the communities have a local weekly newspaper, residents depend primarily on radio and television for regional, national and international news. Three of the towns have local radio stations and most have access to regional radio stations.

The observations noted for Wyoming, Montana and Appalachia are not meant to represent all possible comparisons, the intent is to convey a feeling or awareness for rural communities that may lead to a better understanding of life in rural America.

APPENDIX B
RELATED STUDIES

The Corporation for Public Broadcasting has funded several related studies to examine requirements, costs and availability of equipment and facilities to improve public television services to rural America. The findings from these studies complemented the Public Service Satellite Consortium project.

The first study was an engineering report on "Unattended Low-Power Television Transmitter Designs Suitable for use with Satellite Earth Stations" by Kessler Associates. The intent of this study was to determine the costs and availability of hardware and to establish low-power transmitting systems to deliver public television service to rural, sparsely populated areas. The findings from this report were incorporated in Phase I documentation activities. The contour maps from the report were included in the training package for site survey personnel. Additional information from the report was also utilized in Phase III.

In August of 1977, EDUTEL Communications and Development Inc., completed a related study on the design of unattended video receive-only earth terminals at 12 GHz and 2.6 GHz. The study examined design procedures and equipment recommendations for 12 GHz and 2.6 GHz television receive-only terminals which can be utilized in conjunction with TV translators in the power range from 10 watts through several kilowatts. This study was also utilized as a basis for further systems consideration in the PSSC project.

A second study by Kessler Associates, "STEPS," is presently being conducted. Results from "STEPS," essentially a theoretical study, can be compared and contrasted with the results from the field study conducted by PSSC.

Several other studies were reviewed and, as appropriate, incorporated in Phase I documentation efforts. These studies included:

Broadband Communications in Rural Areas, by Paul Bortz and others, Denver Research Institute, November 1973.

The Feasibility and Value of Broadband Communications in Rural Areas, U.S. Congress, Office of Technology Assessment, April 1976.

Planning for Rural Telecommunications Systems: Phase I - A Methodological Approach to Community Needs Analysis, by Peg Kay and John F. Kramer, Office of Telecommunications Policy, January 1977.

APPENDIX C

PROJECT TASKS AND SURVEY PROCEDURES

Project Tasks

Phase I: Development of Information Base

.PSSC and CPB agreed on procedures for the project.

.Reviewed studies relating to public television for rural audiences.

.Compiled up-to-date information on small earth stations, mini-transmitters, cable systems and translators.

.Compiled information on facilities, equipment and associated costs for limited local origination capability.

.Finalized screening criteria for selection of rural communities.

.Identified, screened and ranked rural communities to be surveyed.

.Developed methodology for site surveys.

.Developed procedures for training site survey personnel.

.Examined existing and proposed state and federal statutes.

.Identified technical, financial and management requirements for small earth stations, mini-transmitters, cable systems and translators.

Phase II: Field Activities

.Met with representatives of National Translator Association and National Cable Television Association.

.Contacted representatives from local, state, regional and national agencies to discuss project and solicit support.

.Identified and trained site survey personnel.

.Selected and notified rural communities to be surveyed.

.Identified and contacted local agencies, institutions, organizations and individuals to be involved in the site survey.

.Formalized arrangements for site surveys.

.Conducted prototype site survey.

.Refined site survey methodology, as appropriate.

.Conducted site surveys.

PHASE III: Analysis

.Analyzed information from site surveys.

.Determined requirements and costs for gaining access to or improving public television service.

.Determined requirements and costs for limited local origination capability.

.Contacted manufacturers and providers of broadcasting equipment and facilities.

.Formulated options to implement operational public television service for each rural community surveyed.

.Prepared final report outlining options, recommendations and procedures to extend public television service to rural America.

Survey Procedures

PSSC developed the following survey procedures in the conduct of this study. Procedures included the development of a process for identifying, screening and selecting communities to be surveyed, and for conducting the site survey itself.

-Reviewed various documents, demographic information and requested input from state agencies to determine areas which did not receive public television.

-Compiled a list of potential sites to be surveyed. (Thirty-two communities were identified in Montana, fifty-four in Wyoming.)

-Developed phone survey procedures for use in preliminary screening to determine community interest in receiving public television and willingness to participate in site survey.

-Identified a contact person (mayor, town clerk, etc.,) in each community.

-Conducted phone survey of potential sites.

-Identified 22 communities in Montana and 24 in Wyoming which indicated an interest in receiving public television and a willingness to participate in the site survey.

-Finalized selection of 18 sites in Montana and 18 in Wyoming.

-Confirmed selection as a survey site with contact person at each site both by phone and in writing. Contact person was given the names of survey team members and approximate date when team would call to set up an appointment. PSSC requested

that contact person inform other community leaders (educators, business people, government employees, translator operator, etc.) of the site survey and convene a meeting of townspeople to meet with survey team.

-Conducted a two-day training session for all site survey personnel, and developed a training manual which included detailed materials used in site surveys.

-Provided survey teams with assigned list of sites to be surveyed, name of contact person, telephone number, and selected information on community compiled from the phone survey.

-Survey teams contacted each community to set up appointment and informed PSSC as to date, time and place of each scheduled meeting.

-PSSC developed a composite itinerary and made arrangements to visit with each survey team in the field.

-Although individual site surveys followed a slightly different format because of community preference and team choice, in general each survey included a group meeting with town leaders, individual interviews with selected townspeople, and a physical survey of the town. When appropriate, team members also visited existing translator sites.

-Survey teams completed required individual site reports within three days of each survey and mailed them to PSSC. A final site report outlining composite findings, observations, and recommendations was also prepared. Sample reporting forms appear in Appendix F.

-An appropriate acknowledgement was sent to each participating community in Montana and Wyoming.

-Specific recommendations were prepared for each participating community, suggesting alternatives to gain access to public television service. A sample follow up letter sent to each community surveyed in Montana and Wyoming is found in Appendix E.

-Follow up, as appropriate, with other state, regional, and national agencies contacted in the conduct of the study was also completed.

APPENDIX D

TRAINING MATERIALS*

I. <u>DEFINITIONS AND DISCUSSIONS OF BROADCASTING CONTOURS</u>

A. Coverage Contours

a. Description and Definition

1. Location and Time Variability Characteristics

b. Classes of Service

B. Topographic Contours

a. How to Interpret

II. <u>BASIC PRINCIPLES OF TELEVISION COVERAGE</u>

A. Definition of TV Coverage

B. Factors Influencing TV Coverage

a. Transmitter Location

1. Terrain Advantage

2. Terrain Disadvantage

b. <u>H</u>eight <u>A</u>bove <u>A</u>verage <u>T</u>errain (HAAT)

c. <u>E</u>ffective <u>R</u>adiated <u>P</u>ower (ERP)

d. Antenna Horizontal Pattern

1. Non-directional Circular Pattern

2. Directional Non-circular Pattern

i. Unidirectional

ii. Figure Eight

iii. Peanut

iv. Cardiod

v. Skull

C. Differences in Coverage Between VHF and UHF

(1) Channels 2 - 6

(2) Channels 7 - 13

(3) Channels 14 - 83

*excerpted from Training Manual

III. HEAD END SYSTEMS

A. Satellite Earth Station

B. Local VHF/UHF Antennas

C. Remote Earth Stations, VHF/UHF Antennas Systems and Microwave Interconnect

IV. MINI-TRANSMITTER SYSTEMS

A. VHF & UHF

B. Exciter/Modulators

C. Power Amplifier 10 Watts & 100 Watts

D. Mini-Transmitter-To-Antenna Transmission Line

E. Transmitting Antenna Supports

a. New Tower or Existing Structures

F. Low-cost Transmitting Antennas

V. TRANSLATORS

A. Basic Components

B. VHF-to-UHF

C. UHF-to-VHF

VI. HARDWARE FAMILIARIZATION

A. Pictures and Brief Discussion of Typical Equipment Modules

VII. EQUIPMENT PACKAGE COST ESTIMATES

A. To include a special low-power unit for very small communities which will be less than half the cost of the 30 watt ERP unit presented in CPB Mini-Transmitter Report dated August 31, 1977

B. Capital Cost Estimates for 5 Meter TVRO Earth Station

C. Capital Cost Estimates for 10-watt VHF (50-watt ERP) and 100-watt UHF (500-watt ERP) Translators

D. Capital Cost Estimate for Remote Pick-Up Antenna and Microwave Link

E. Installation Costs and Annual Maintenance Costs for A, B, C, & D above

VIII. BRIEF REVIEW OF APPLICABLE FCC REGULATIONS

A. Translators

a. Maximum VHF Translator Power

1. One Watt East of the Mississippi River
2. Ten Watts West of the Mississippi River
3. 100 Watts on an Assigned Channel

b. Maximum UHF Transmitter Power

1. 100 Watts
2. 1000 Watts on an Assigned Channel

c. No Limitations on ERP and Antenna Height by FCC. However, considerations must be given to FAA (Federal Aviation Administration) air-space restrictions

d. Unattended Operation Permissible, Provided:

1. If translator cannot be reached at all hours and in all reasons, means shall be provided so that the transmitting apparatus can be turned off and on at will from a remote which is readily accessible at all hours and in all seasons
2. The translator shall be equipped with suitable automatic circuits which will place it in a non-radiating condition in the absence of an input signal
3. The translator apparatus and the on-off control (if at a location other than the translator site) shall be adequately (locked) protected against tampering by unauthorized persons

e. Technical Personnel Requirements

1. Second-class operators license required if adjustments are to be made which affects emission
2. Operators license not needed by installor of FCC Type accepted equipment but must have sufficient skill to follow manufacturers instructions
3. Simple maintenance such as the replacement of tubes, fuses, or other plug-in components and adjustments which require no particular technical skill may be made by an unskilled person (underlining added)

4. FCC must be supplied with the name, address and telephone number of a person or persons who may be contacted to secure suspension of operation should such action be deemed necessary by the FCC

f. Co-Channel and Adjacent Channel Mileage Separation Requirements (See Section 74.702 of the FCC Rules and Regulations)

g. Translator Station Identification Requirements

Either:

1. Automatic identification in international morse code at least once per hour, or;
2. By arranging for the primary station to transmit an identification as per Section 74.783(a)(2) of the FCC Rules and Regulations

B. Mini-Transmitters

a. No provisions in the FCC Rules and Regulations for operating mini-transmitter. Therefore, for licensing purposes it will be possible to consider licensing under the following options:

1. Translators with provisions for local origination (a waiver of the rules will be required with this procedure since the current rules limit local origination (as a mini-transmitter) to UHF translators broadcasting <u>still photographs</u>, <u>slides</u>, and recorded voice announcements
2. As an experimental television broadcast station under Subpart A Section 74.101 of the FCC Rules and Regulations
3. A successful petition to change the FCC Rules and Regulations to regularize mini-transmitters under a set of rules similar to the current rules governing translator operation

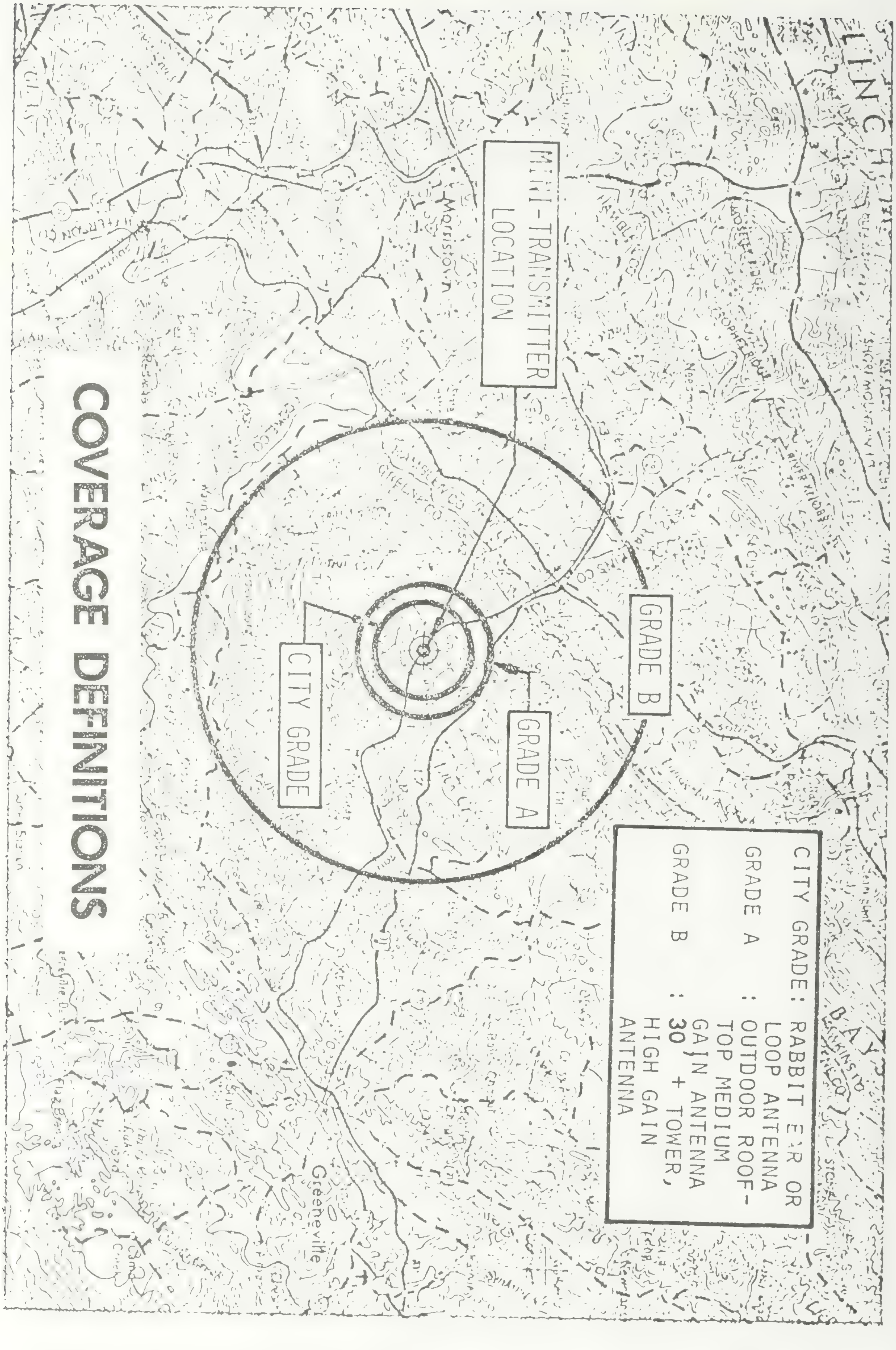
IX. <u>AIR SPACE CONSIDERATIONS FOR TOWERS</u>

A. A tower can be constructed without FAA approval <u>provided</u> the overall height of the structure does not exceed any nearby natural elevation by more than 20 feet

B. FAA approval needed for almost all towers near airports

C. Detail criteria found in Federal Air Regulations Part 77 "Objects Affecting Navigable Air Space"

D. Excerpts from the Federal Aviation Regulations Part 77 of the most important criteria appears on the front (yellow page) of FAA Form No. 7460-1 "Notice of Proposed Construction or Alteration"

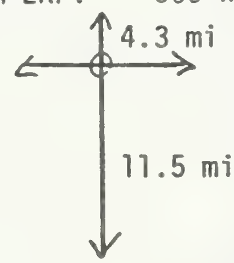

COVERAGE DEFINITIONS
MINI-TRANSMITTER LOCATION
GRADE B
GRADE A
CITY GRADE
CITY GRADE: RABBIT EAR OR LOOP ANTENNA
GRADE A : OUTDOOR ROOF-TOP MEDIUM GAIN ANTENNA
GRADE B : 30' + TOWER, HIGH GAIN ANTENNA
Greeneville

MAXIMUM AND MINIMUM DISTANCES
IN MILES TO GRADE B CONTOURS

VHF
(Ch 2 - Ch 6)

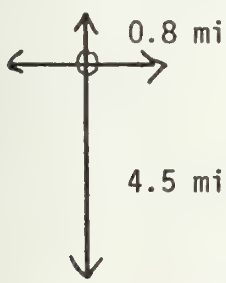
Trans. Power: 10 Watts
System ERP: 50 Watts

Trans. Power: 100 Watts
System ERP: 500 Watts

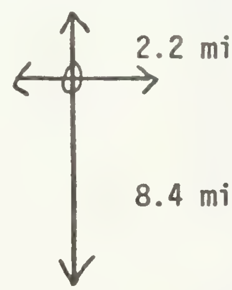


VHF
(Ch 7 - Ch 13)

Trans. Power: 10 Watts
System ERP: 50 Watts

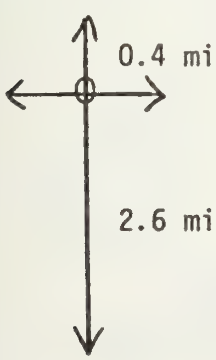


Trans. Power: 100 Watts
System ERP: 500 Watts

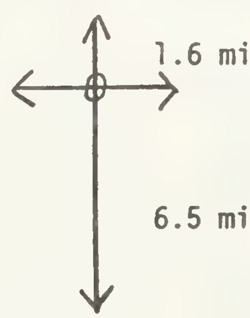


UHF
(Ch 14 - Ch 69)

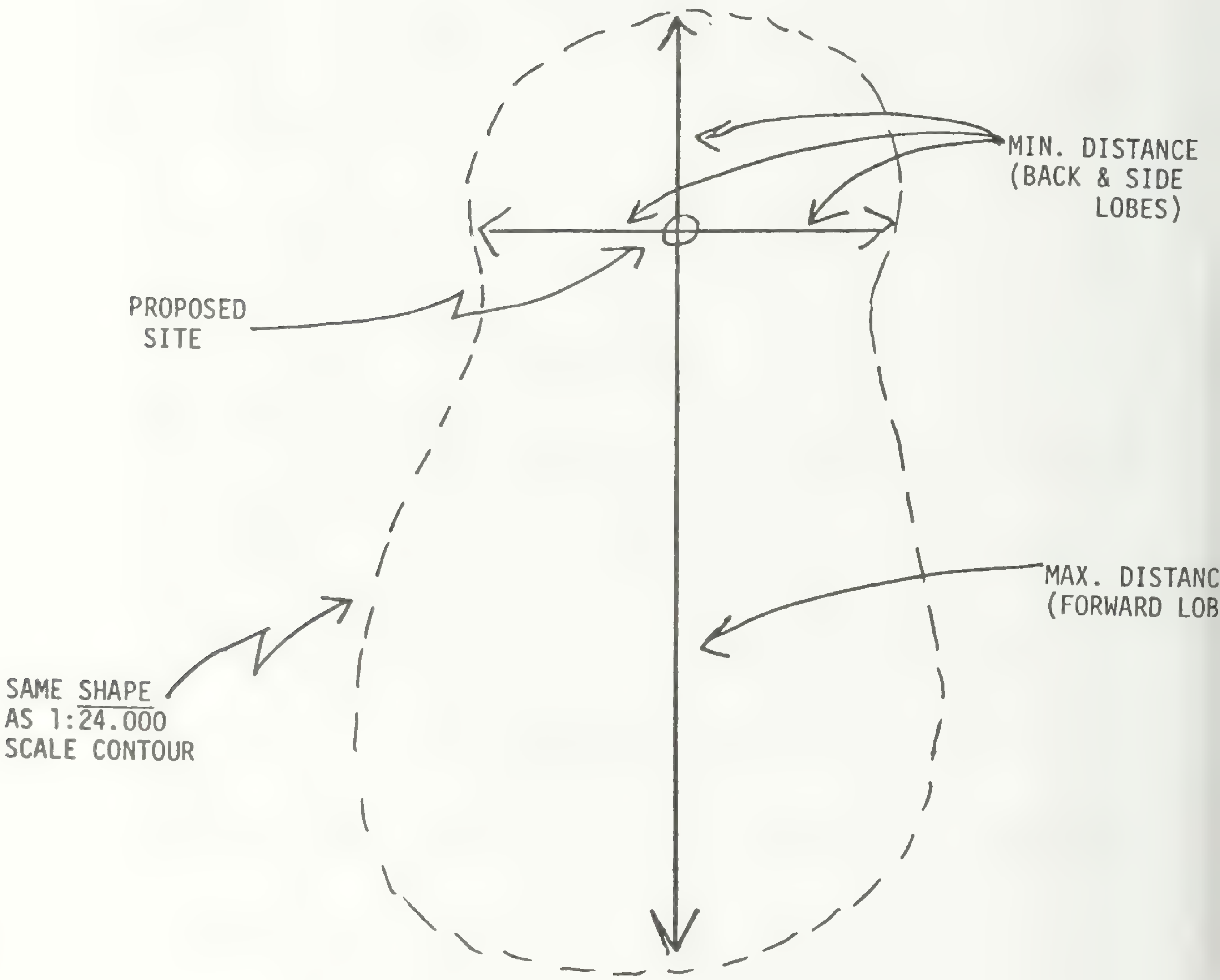
Trans. Power: 10 Watts
System ERP: 60 Watts

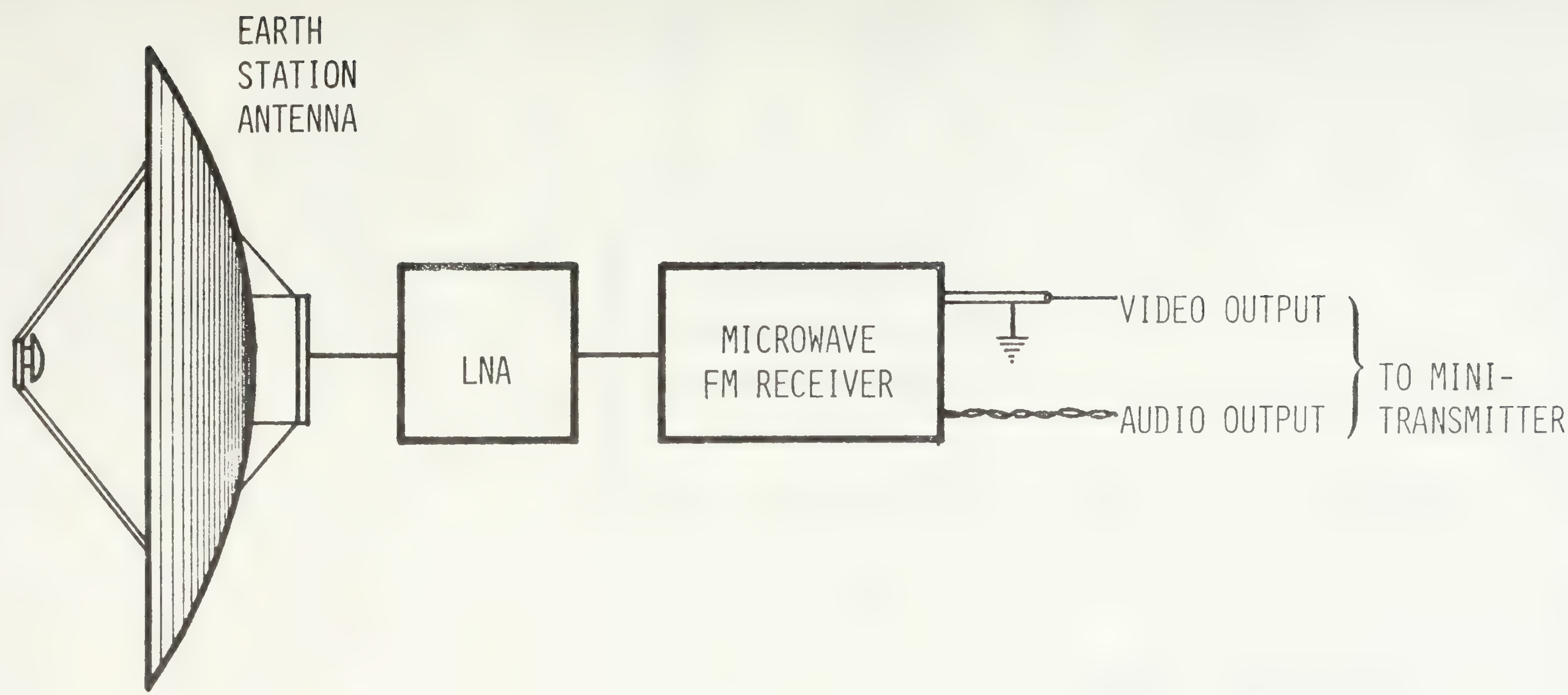


Trans. Power: 100 Watts
System ERP: 600 Watts

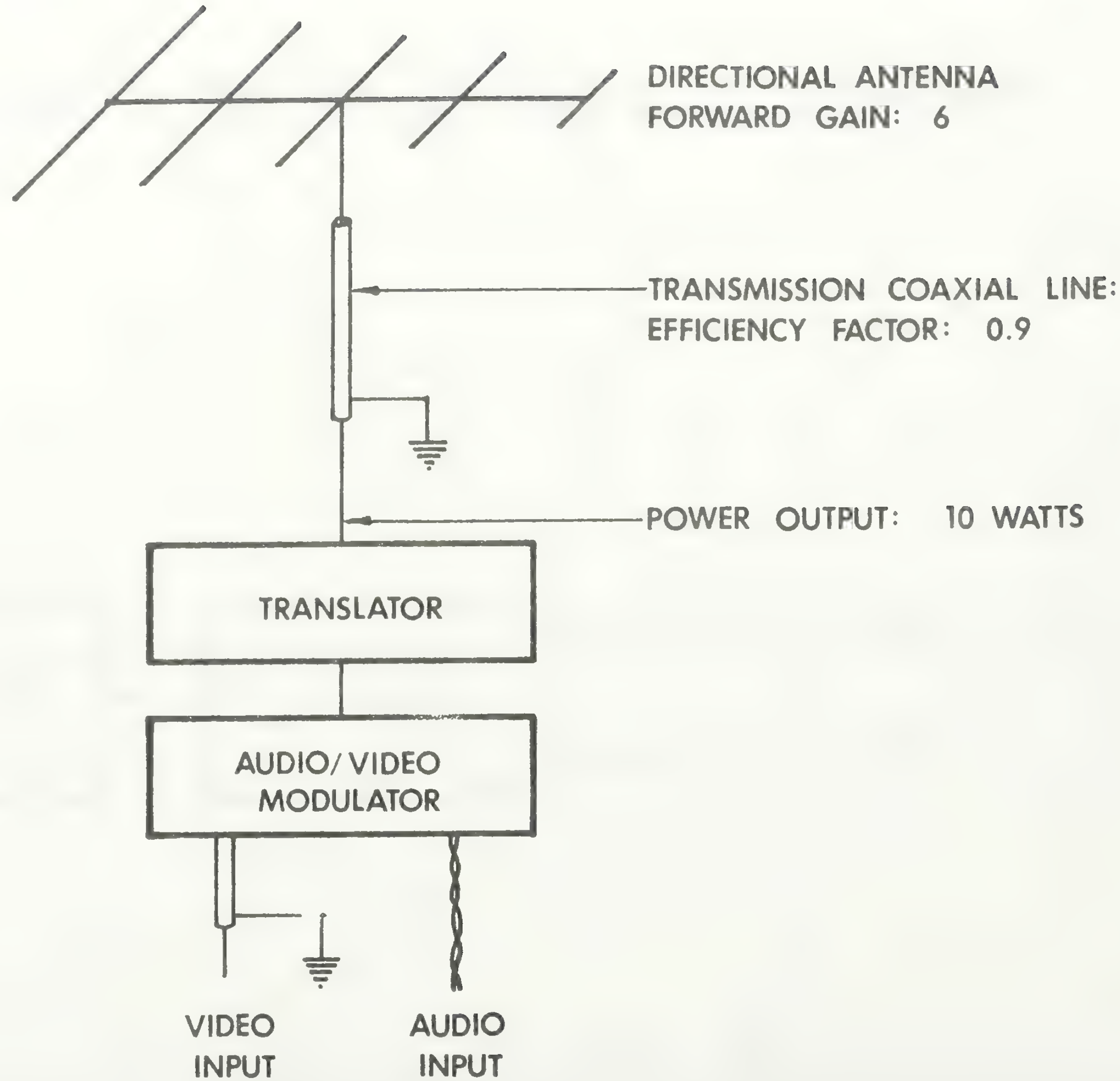


CONSTRUCTION OF APPROXIMATE
GRADE B COVERAGE CONTOUR





LOW-COST TVRO SATELLITE EARTH TERMINAL



BASIC ELEMENTS OF A MINI-TRANSMITTER

CAPITAL COST, INSTALLATION, AND ANNUAL OPERATING EXPENSE FOR A TYPICAL LOW-COST TVRO SATELLITE EARTH STATION

A. CAPITAL COST

1. 5-meter antenna	$10,000
2. Gas FET LNA	3,100
3. Receiver	8,750
4. Miscellaneous cable, connectors, etc.	500
Total Capital Cost:	$22,350 (June, 1978) $14,000 (December, 1978)

B. INSTALLATION

1. Two man crew for 2 days plus travel and per diem	$ 2,000
2. Concrete foundation for 5-meter antenna	3,500
Total Installation Cost:	$ 5,500

C. ANNUAL MAINTENANCE

1. Parts	$ 500
2. Travel and maintenance time	750
Total Annual Maintenance Cost	$ 1,250/yr

NOTE: Above estimates do not include:

1. Real estate costs
2. Equipment shelter
3. Power service consumption

CAPITAL COST, INSTALLATION, AND ANNUAL OPERATING EXPENSE FOR A 10 WATT VHF MINI-TRANSMITTER SYSTEM

A. CAPITAL COST

I. Transmitter Facilities

1. Mini-Transmitter:	
a. Modulator	$1440
b. 10 watt VHF Translator	5400
2. Transmission Line	215
3. Antenna	135
4. Tower	1000
	$8190

B. INSTALLATION COST

Approximately 10% of Capital Cost $ 820

C. ANNUAL MAINTENANCE COST

Approximately 6.5% of Capital Cost $ 535

NOTE: Above estimates do not include:

1. Real estate costs
2. Studio/transmitter building costs
3. Power service and consumption

PUBLIC SERVICE SATELLITE CONSORTIUM

Appendix D
Training Materials

...AL OFFICE
[illegible]
... CALIFORNIA ... • ...

... AVENUE
... COLORADO ... • (303) 458 ...

... STREET N.W.
...TON D.C. 20036 • (202) 659 ...

PUBLIC TELEVISION SERVICE IN RURAL AMERICA

SURVEY PERSONNEL TRAINING

Denver, Colorado
July 31 - August 1, 1978

July 31, 1978	Agenda	
9:00 - 10:00	Introduction Orientation and Overview of Study Role of Public Service Satellite Consortium Role of Corporation for Public Broadcasting The Public Television Satellite System	Louis Bransford Kathleen King Glenna Northrip
10:00 - 12:00	Technical Systems: Broadcasting Contours Principles of Television Coverage	William Kessler Dail Ogden
1:30 - 3:00	Head End Systems Mini-Transmitter Systems Translators	William Kessler Dail Ogden
3:15 - 4:00	Local Origination	Polly Rash
4:00 - 5:00	FCC Regulations State and Federal Statutes	William Kessler Dail Ogden

* * * *

August 1, 1978	Agenda	
9:00 - 10:30	Equipment and Facilities Costs and Requirements	William Kessler Dail Ogden Polly Rash
10:30 - 11:00	Role of the Community	Glenna Northrip
11:00 - 12:00	The Survey: Procedures Instrumentation Scheduling Reports Deadlines	Kathleen King Glenna Northrip
1:00 - 2:30	Survey/Prototype	Glenna Northrip
2:30 - 3:00	Business Arrangements: Payment Reimbursement	Louis Bransford Kathleen King
3:00 - 3:30	Next Steps	Louis Bransford

Appendix D
Training Materials

TRAINING MANUAL

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29. illustration of Six Foot Parabolic Microwave Antenna
30. illustration of FM Microwave Transmitter and Receiver
31. illustration of 100 Watt UHF Translator
32. illustration of 10 Watt VHF Translator
33. illustration of Low Noise Amplifier
34. illustration of Audio/Video Demodulator
35. illustration of Receiver
36. illustration of Audio/Video Modulator
37. Capital Cost, Installation, and Annual Operating Expense for a:
    - Typical Low-Cost TVRO Satellite Earth Station
    - 100 Watt UHF Mini-Transmitter System
    - 10 Watt UHF Mini-Transmitter System
    - 100 Watt VHF Mini-Transmitter System
    - 10 Watt VHF Mini-Transmitter System
    - Remote Pickup and One-Hop Microwave Program Relay System
    - Capital Cost of Individual Equipment Items and Interface Hardware

ection 3: CC egulations

1. General Guide for Television Translator Applicants (FCC document, revised May, 1976)
2. Television Broadcast Translator Stations (FCC: 74.701, subpart G)
3. Experimental Television Broadcast Stations (FCC: 74.131, subpart A)
4. Notice of Proposed Construction or Alteration (FAA form 7460-1)
5. State and Federal Statutes

ection 4: ocal rigination

1. five page narrative
2. Hypothetical Budget for Local Transmission
3. Hypothetical Budget for Mini-Studio
4. diagram of Sample Mini-Studio
5. Definitions

ection 5: urvey rocedures

1. Survey Team Responsibilities
2. Community Profile form
3. Site Survey Questionnaire
    - Part A: Community Information
    - Part B: Technical Information
4. Daily Survey Log form
5. Appointment Schedule/Telephone Log form
6. Final Site Report Format
7. Final State of Region Report Format
8. memo on Policies for PTV in Rural Areas Project
    - travel expense claim form
    - how to complete travel expense claim
    - policy on use of rental vehicles
    - policy on use of PSSC credit cards

Appendix D
Training Materials

Section 6: Materials for Rural Communities

1. PSSC brochures (2)
2. Study Abstract
3. description of Corporation for Public Broadcasting
4. Terminology and Acronyms
5. PBS Program Schedule
6. Local Origination:
   - 5 page narrative
   - Hypothetical Budget for Local Transmission
   - Hypothetical Budget for Mini-Studio
   - illustration of Sample Mini-Studio
   - Definitions
7. Capital Cost, Installation, and Annual Operating Expense for a:
   - Typical Low-Cost TVRO Satellite Earth Station
   - 100 Watt UHF Mini-Transmitter System
   - 10 Watt UHF Mini-Transmitter System
   - 100 Watt VHF Mini-Transmitter System
   - 10 Watt VHF Mini-Transmitter System
   - diagram of Low-Cost TVRO Satellite Earth Terminal
   - diagram of Basic Elements of a Mini-Transmitter
8. Capital Cost, Installation, and Annual Operating Expense for a:
   - Remote Pickup and One-Hop Microwave Program Relay System
   - Capital Cost of Individual Equipment Items and Interface Hardware
   - illustration of Remote Antenna and Microwave Link to Mini-Transmit
   - diagram of Remote Antenna and Microwave Link to Mini-Transmitter
9. Six Ways to Bring Better TV Reception to Your Community

Public Service Satellite Consortium

January 3, 1979

APPENDIX E
SAMPLE FOLLOW UP LETTER

Mayor Olive R. Hagadone
Box 613
Boulder, Montana 59632

Dear Mayor Hagadone:

We appreciate your interest and willingness to assist PSSC in conducting a survey of selected rural communities for the Corporation for Public Broadcasting. The findings from the study support several viable possibilities for extending or improving public television service in rural America. Accordingly, as we indicated in our earlier communications, we are submitting further information for your community's review and consideration.

A review of the survey results for Boulder in the San Diego office of PSSC confirms that the most practical means of bringing public television to Boulder is by means of a small earth station and mini-transmitter combination. The earth station/mini-transmitter facility should be located at either one of the two commercial translator sites.

The approximate cost of a small earth station using a 4.5 meter (approximately 15 feet) receiving antenna is currently $14,000. The concrete footings and installation cost would be in the neighborhood of $5,000. Annual maintenance costs should not exceed $1,500, since earth station electronic components have proved to be very reliable.

The cost for the mini-transmitter would range from approximately $8,200 to $17,500 depending on whether a 10-watt VHF or a 100-watt UHF mini-transmitter was used in conjunction with the earth station. A 10-watt VHF mini-transmitter would be most desirable. However, the final choice between a VHF channel (Channels 2 through 13) and a UHF channel (Channels 55 through 69) cannot be made until a study is initiated and completed to establish channel availability for the mini-transmitter.

The cost range quoted above does not include shelter for the earth station/mini-transmitter electronics, or real estate costs.

PSSC, realizing that costs at the present time could be prohibitive has recommended to CPB that outside funds must be identified and mobilized

PRINCIPAL OFFICE:
0 SORRENTO VALLEY BOULEVARD
AN DIEGO, CALIFORNIA 92121
714-452-1140

2480 WEST 26th AVENUE
Suite 90B
DENVER, COLORADO 80211
303-458-7273

1126 16th STREET, N.W.
WASHINGTON, D.C. 20036
202-659-2277

to bring about the implementation of an operational rural public television network. We are hopeful that some funding will become available to offset some of the costs we outlined above. We will keep you informed on the outcome of our study. If other funds become available in your community to accelerate the process, PSSC would be pleased to assist in conducting the detailed engineering survey, designing specifications, procuring and installing equipment and facilities, training of staff, maintenance and management.

The survey team and the project staff of PSSC appreciate the opportunity of working in your community and bok forward to a continued working relationship with you and the citizens of Boulder. We encourage you to make your community's needs and interests known to Mr. Curt Wheeling, Administrator, Communications Division, State of Montana, Department of Administration, Sam W. Mitchell Building, Helena, Montana 59601.

Sincerely,

Louis A. Bransford
Director of Service Development

cc: C. Wheeling

APPENDIX F
SAMPLE SITE SURVEY REPORTS

PUBLIC TELEVISION SERVICE IN RURAL AMERICA

Final Report for Northwest and Western Montana
Survey Team: Jim DeBree and Jack Gill

1. Composite Observations

Without exception, in all eight communities we visited we were received in a warm, friendly, and interested manner. One community even agreed to meet with us on a Saturday. In some cases farmers interrupted their wheat harvesting to attend a meeting. The groups we met with were predominantly male, although three of the communities had woman mayors. In most of these communities the local contact person had gathered together a group of 6-8 members of the community, most of whom were members of the city council or held some other responsible position in the community. On this basis, we feel that the information we collected is valid for each of the communities. We did not visit Ft. Benton because the night before we were scheduled for the visit the mayor called to indicate that he was unable to schedule anyone to meet with us.

All of the communities receive their television signals via translators owned and operated by a local tv translator district. In some cases a few homes receive signals direct from a broadcast station, but these are a very small minority.

While there are some differences from community to community concerning replies to the survey questions the communities are notable for their overall similarities, in our opinion.

2. Findings

We find the following similarities in the communities we visited.

** The tv translator districts are under the supervision of one or two persons who have taken on the responsibility mainly because they find it interesting. Over the years they have become very knowledgeable concerning translator technical operation and regulatory requirements.

** All of the communities fund their translator operations through a tax district, permitted by Montana law. In all but one community, this money is collected by the county. The exception is in Virginia City where, once a year, a volunteer goes door to door collecting donations.

** All of the tv translator districts are presently taxing near or at the $16 per year limit. Therefore, there is limited money available from this source to fund a public tv signal.

** Most of the districts have built up a reserve fund for replacement of equipment in the future.

** All communities are luke warm concerning the idea of local origination. It is our opinion that the brief verbal description of this potential we gace them is not sufficient to convey to them what such a capacity was and how it might be used in the community.

** Every community except Thompson Falls had one or two individuals with whom we met who had some personal experience with public tv programs and spoke highly of them to the rest of the group. Most people had heard of Sesame Street.

** The communities are generally satisfied with their local educational systems, their leasure time opportunities and their climate. Most would like more cultural opportunities.

** Every community has a public library. Several have new buildings. Some have very extensive holdings for the size of the community.

** All communities have numerous bars down Main Street. There is a considerable amount of social drinking. In two communities this was actually listed as a major leasure time activity.

** All translator sites have commercial power and would seem to be amenable to solar and wind power.

** All communities have the same form of local government: a mayor and city council.

** No community has a CATV system, although three communities have been visited by cable interests exploring the possibility. In Thompson Falls there is a concern by the translator district officials that a cable in town would reduce the funding base of the district and thereby adversely affect the signal to those living outside of the town.

** All are concerned with the cost to bring in a PTV signal, especially if an earth station were required.

** In each community the translators are either all VHF or all UHF. There is no mixing, requiring dual antennas for tv receivers.

** All translator sites are difficult to reach. At White Sulpher Springs it took us two hours cross country via a 4-wheel drive vehicle to make a round trip between the site and the town.

** In those communities where we talked with school officials, they are interested in getting instructional tv programs for their schools. Even though we explained that PTV programs are not designed for formal inclass instruction we aren't sure that this fact really sunk in.

** Most of the communities are interested in exploring with neighboring towns the possibility of sharing costs in some way in bringing in a PTV signal.

We find the following differences in the communities.

** In the majority of the communities visited -- Browning, Chester, Chinook, Boulder, White Sulpher Springs, Thompson Falls -- the individuals we met with are concerned that any PTV signal brought in reach the current extended audience outside of the incorporated town area presently reached by their translators. In other words, the townspeople feel a responsibility for their rural neighbors. In the other communities, the terrain was such that their translators covered only the immediate incorporated area.

** Some communities have been approached concerning a CATV installation; most have not.

** The technical quality of translator installations seems to vary from community to community. Some communities say their present signals are fine; others complain about constant variations in signal quality. Some communities have the assistance of broadcast station engineers; most go it alone with whatever local resources they have, ie. a local tv repairman. In Phillipsburg, the translators are located downhill from the community. The antennas are on top of a barn; the equipment in the hay loft in an old freezer. The antennas are surrounded by a large and mature grove of cottonwoods, which must adsorb a considerable amount of the radiated energy.

** Those communities with a primarily agricultural base seem to be those communities that have a sufficient financial base that might permit them to finance a PTV signal.

** Browning is the only town on an Indian Reservation. They might be able to receive financial assistance from the Bureau of Indian Affairs to bring in a PTV signal.

** Boulder is the only community with a state institution.

** Phillipsburg is the only community where the school building is wired for closed circuit tv.

** The plains communities -- Browning, Chester, Chinook -- had the poorest tv signals from their translators, due to the distance between the translators and the towns.

** Thompson Falls was the only community receiving no tv signals from Montana stations. All of their channels come from Spokane.

** The Western communities are in counties where a large percentage of the land is under Forest Service management.

** Browning is the only community where the local leadership is not White Anglo Saxon Protestant; it is Indian.

We did not observe many patterns.

** Where the current translators cover an area greater than the incorporated town itself, concerns are expressed that a PTV signal cover the same area.

** Where there are citizens who have had personal viewing experience with public tv programs, they have voiced a high level of complimentary remarks concerning what they saw.

3. Generalizations

** Any PTV signal brought into a community should probably originate from the same location as the present translators in that area. This would eliminate the need for a new building, access roads, and power sources. The signal should be either VHF or UHF, matching what is already in use. This would eliminate the need for any additional receiving antennas in the community.

** There is a concern in all of the communities with a lack of cultural opportunities. The communities feel they need PTV eve more than urban areas who already have many opportunities due to their larger size.

** Community populations are generally stable; there is little evidence of transients. So the people in these communities are there to stay and are interested in bettering what they have rather than moving somewhere else.

** All the communities tend to be seasonally employed. They have alot of time on their hands in the winter.

4. Conclusions

There is a definite and strong interest in all communities visited, except one, for bringing in a public television signal. That one exception is Thompson Falls and this eems due to the fact that no one we visited with had any personal experience with the programs. The individual running the translators said, however, that he gets frequent inquiries from people moving into the area as to why one isn't available because they had it elsewhere and miss it.

All of the communities are concerned with the cost of bringing a signal in, especially if it would entail building an earth station. But several thought it could be done with local funding "if the people wanted it." In Chinook they were saying that if the Lions Club and Chamber of Commerce were behind the idea that it would happen.

We believe that it is unlikely that any of these communities will pursue acquiring a PTV signal solely on the basis of our visit. These communities will require additional hand holding, information, and technical assistance before they get the ball rolling on their own.

The possibility of a community acquiring a PTV signal would be greatly enhanced if the costs of same could be shared with other communities. In most of the communities we visited an earth station could be located to serve several communities. Therefore, if all of the communities in such an area could be informed concerning PTV and how it could be acquired, shared cost projects might be initiated.

We recommend that PSSC and CPB explore the possibility of funding a demonstration program designed to bring to these communities actual PTV programming. At one end of this demonstration spectrum we can see a portable earth station and translator which could be brought into a community for a week to run PBS programming plus other materials on video tape. This could also include demonstrations of local origination capabilities and the use of the system in the local schools. At the other end of the spectrum, it might be as simple as bringing in a video cassette player and a set of tapes to the local library for a week for people to come in and look at.

We sense that communities would be more inclined to move ahead with such a project if there was a wider knowledge of what they would be getting for their money. It is not satisfactory to try and vebalize the programming.

We also believe that efforts should be made to involve appropria state agencies. For example, in the territory we covered, there appear to be several sites where if a PTV signal could be provided by the

State, local communities could afford to pick that signal up and to rebroadcast it into their communities via a translator. The biggest difficulty we see at this time is the fact that there aren't such signals available. In those communities where a PTV signal is available, it is distributed by CATV.

The two of us enjoyed working on this project and would welcome the opportunity to work with PSSC in the future.

Appendix F
Sample Site Survey Reports

FINAL SITE REPORT

Boulder, Montana
DeBree, Gill

Met in the morning with small group of local leaders then followed up in the afternoon with individual visits. People are very friendly and indicated a stong interest in public broadcast. Community does enjoy an excellent signal on commerical stations.

An excellent system is in place and people are proud of what they have been able to develop over the years. Town is located in a small valley that would lend itself to a small translator system.

Transmission Site should be situated within present system

Small earth station could be incorproated into prenent system very nicely. One could also be located on the contintenal divide where Boulder picks up their signal.

mini Transmitter could be used very effectively in library.

Cable system would be to costly to install

Translators are presenty being used. People know and understand translators and have the capability to service them

local origination would be possible in the shcools and considerable interest was expressed.

Finances would be a problem however people indicated they would certainly assess themselves if better programs could be made available. They would like assistance from the state and because they are the home for one state institution they feel the state might be interested.

Very much interest however finances would be a problem. their current system is in excellent shape and have excellent service personnel to maintain system.

People were also interested in the state of Montana pursuing a state network providing better educational programs.

COMMUNITY PROFILE

Instructions: Information requested below may be submitted in narrative form. The purpo[se is] to record subjective data on the community itself and your impressions, observations, etc. as a result of the visit. This report is DUE WITHIN 3 [days] of the site survey.

Community Name: Boulder Mt

Date of Site Survey: 8 Aug 78

Survey Team: DeBree Gill

DESCRIPTION OF INTERVIEW: (names of people interviewed, their position in the community, duration of interview, setting, discussion, etc.)

Olive Hagadone, Mayor, Kenneth Trettin,city clerk, Wade Lewis,tv applianc Ralph Simons, Mont Power, William Shoqist, Tv District board member, Merc Vosburg, County School Supt., Pam Kanies,librarian. Spent the am discussing Public tv and the potential for their community. Afternoon in individual visits to determine community system. Very much interested i public tv for several of the group were familiar with current programs. they feel their is an opportunity to utilige the facilities of the Boulder River school for the mentally ill.

DESCRIPTION OF COMMUNITY: (significant or unique characteristics -- may include populatio[n,] geographic, economic, political, educational, resources, etc.)

County seat town and home of a state institution. town is seperated from rest of the county by mountinous terrain. Appears to have a growing popula[tion] and the library is beginning to serve as a focal point for adult education[al] programs. Local school has video equipment that is used for local sports events. Town is lacking is financial resources. Town is situated about halfway between Butte and Helena.

ATTITUDE OF COMMUNITY: (receptive, skeptical, hostile, etc.)

People were a bit skeptical at first because the thought we were involved with a private company that had tried to implement cable tv/ using satelli[te] and lacal translator. Group changed their attitude as soon as they underst[ood] the program and became very interested in survey. Cooperated beautifullyl One member felt the State of Montana should be involved in assisting small towns establish an educational network. Town receives its signal from transmitters located on the contintental divide. They felt an earth statio[n] could be located near the present transmitters on the divde.

OTHER COMMENTS OR OBSERVATIONS:

Boulder may have the best system to date& they now are replacing one translator with a new model just purchased. They would very much like to have public t v but their TV district generates $1500/year. Local leaders indicated that people would support public TV with an annual assessment. State School in the community represents an additional resource that may be interested in local origination capability.

Mail to: Dr. Louis A. Bransford
Public Service Satellite Consortium
4040 Sorrento Valley Blvd., Suite D
San Diego, CA 92121

Appendix F - Sample Site Survey Reports

FINAL REPORT

SURVEY TEAM - Patricia Aaker
Ralph K. Aaker

August 27, 1978

Communities that we covered ranged from the small community of Ryegate, Montana, population 258 to the largest of Plentywood, Montana, population of 2,400. We did not have any community that had an ethenic composition. All of the areas relied on farming and ranching, some oil and coal, as the economic bases of the community.

The terrain ranged from mostly gentle rolling slopes in the Northeastern part to the hilly, somewhat timbered in the mid-section of Harlowton, Ryegate, and Roundup. Most rural people live in the valleys.

The communities in the Northeastern part of the state were not served by bus and relied mainly on their own car or truck for transportation into the larger populated towns, such as Billings, a population of approx. 120 ,000. Most of the towns had an airstrip of some sorts. No commercial air travel however, just charter or private aircraft. Hospitals were small but available in seven of the nine towns that we visited. Roundup's hospital will probably re-open in the very near future.

It seemed that books were available either in a local library or by book mobiles. None of these communities had an adequate book store for purchasing servious books.

The weather pattern in Eastern Montana is lots of wind and cold temperatures, with little snow, except last winter they received lots of snow. The summer temperatures are comfortable with the evenings cooling off.

For the most, fishing and hunting seemed to be the biggest activity mentioned for recreation and leisure. No one readily admitted that they watched television any great amount of time. More viewing of TV in the winter months.

All of the communities centered a great deal of their time to the local elementary and high school activities.

The Sr. Citizens played an important role in each community as there seemed to be alot of retired people in all of these rural areas.

All of the towns had the usual organizations, clubs and etc.

Weekly newspapers were published in 8 of the towns that we visited with one paper covering the 9th. Most people subscribed to the Billings Gazette and some to the Great Falls Tribune, daily papers. Most of the communities relied on talking to people they know for day to day news. During the day they tuned in to Montana radio to hear the news of the state.

POINTS OF GENERAL SITUATION

1. Seven communities were positive towards PTV and requested follow-up assistance. Two communities, Jordan, and Harlowton, show indifference largely because o the mayors and Harlowton's railroad situation.

2. Costs of receiving PTV were the top subject and concern of all the communitie It boils down to a high cost distributed among few people.

3. To identify an organization willing, qualified, and with enough clout to follow through with what ever plan may be devised, is a most important considerati. We made a major point of this issue and hope that the groups selected will follow through. In some cases, the lead may change, but someone must carry the ball to see that correspondence and planning is carried out.

4. The proposal made at the Scobey, Jordan, and Circle communities, for broadbanding of rural telephone lines is strong. Leaders expressed optimism that legislation would be passed in 1979, allowing this to be done. Certainly with VHF frequencies filled and UHF questionable, this is the most promising method in the areas they serve.

5. While spending a week-end in Wolf Point, Montana, contacts were made and we believe that they will want PTV. While this community was not on our list of communities to survey, it could be included. Mr. Wally Olds, CATV operator will cooperate as we determined from him in Plentywood for Wolf Point. Kathy King has our list of people, addresses and phone numbers on who to contact in Wolf Point.

6. In some communities there is a strong sentiment against Educational TV because of what happened in the state legislature about three years ago. We got this from legislators we knew and met on week-ends while in Montana.

. Everywhere we went, people expressed a distaste for cop shows, violence and much of present commercial programming, but were willing to watch it.

. People were satisfied with their present translator reception. One community, Ryegate, expressed the want to increase power from 1 watt to 10 watts to possibly reach a few more homes. The one cable operation that we encountered operating in Wibaux, was in our opinion acceptable and provided a service.

. VHF translator capability appears possible in Harlowton, Ryegate and Roundup. The far eastern communities of Broadus, Plentywood, Scobey, Jordan, Circle and Wibaux, VHF use is questionable, because all frequencies are being used. Further studies will be necessary in the use of VHF. The use of UHF translators are also questionable in all Montana communities we surveyed because of the rolling hilly terrain.

10. The eastern Montana towns are very sensitive to the needs of rural people and TV reception. Roundup, Ryegate and Harlowton have small translators. These translators tend to cover the towns only, while rural areas fend for themselves, with their own translators or direct pick-ups.

11. Microwave distant reception from common carriers is not economical in all of the areas we visited.

12. The impact of the Milwaukee Railroad, discontinuing present operations, in the terminal town of Harlowton, would be extremely heavy. One hundred fifty railroad jobs will be eleminated and there appears no other alternative to provide employment at this time. Ryegate, and Roundup will also feel the Railroad effects but of lesser extent.

13. Our final conclusion would define ten communities, we visited, to want PTV. To divide the cost of receiving dishes and translators among so few people is the main and major question. All towns we visited were made up of a high percentage of retired older people on limited incomes.

The communities of Plentywood, Wolf Point and Wibaux will receive PTV via CATV.

The rural telephone cooperatives legislation on broadbanding lines to rural areas is in our opinion a most viable way to receive TV. For these areas it makes political sense, however, we also understand the impact of this proposal on CATV operators and Translators.

Patty and I very much enjoyed this experience and are grateful for it. We would welcome future opportunities as we work well together. I would welcome job related work in any area that may present itself. I feel my ten years of CATV activity, political, County Agent and people orientated work may fit somewhere if the opening and my experience should become a match.

Appendix F
Sample Site Survey Reports

FINAL SITE REPORT

Broadus, Montana
Patricia and Ralph Aaker

wa. our candid and somewhat surprised observation that this community very interested in PBS service. Our background of county commissioner, nty extension, chamber of commerce and community planning was most help- in communicating. We did not expect such a favorable attitude. The nty commissioners have money available through general revenue sharing. ounty special improvement district (SID) is possible, requiring 40% of payers favorable response within the boundaries of the proposed district. taxing translator districts are possible also and this money has not n assessed for the past three years. The county commissioners have used eral revenue sharing revenues to finance translators.

unreliability of the present translators was a concern and people difficulty believing that a satellite receiver and translator would relatively trouble free.

next step for this community will be a coordinated effort with PSSC an engineering feasility study. VHF translator distribution is de- itely the best method because of the rolling terrain and most rural ple live in low areas making UHF translators questionable.

use of interest and rural area support, a VHF 100 watt translator would ideal, but again, this must be checked for spurrious signals and second- harmonics. The only two channels available are Ch 8 and 13 and both questionable because of co-channel interference.

summarise by requesting on behalf of this community, a desire for ineering, financial and planning assistance.

COMMUNITY PROFILE

Instructions: Information requested below may be submitted in narrative form. The purp
to record subjective data on the community itself and your impressions,
observations, etc. as a result of the visit. This report is DUE WITHIN 3
of the site survey.

Community Name: Broadus, Montana

Date of Site Survey: Aug. 6 & 1978

Survey Team: Patricia Aaker

Ralph K. Aaker

DESCRIPTION OF INTERVIEW: (names of people interviewed, their position in the community, duration of interview, setting, discussion, etc.)

See attached sheet

DESCRIPTION OF COMMUNITY: (significant or unique characteristics -- may include populat geographic, economic, political, educational, resources, etc

A ranching, rolling hill community. Favorable climate. A 1st class gra high school with calf roping competition as an activity of high interest county economically exports school funds because of oil revenue which is in the state. Funding of public TV, always a problem, is possible as expressed by city, county and community leaders assembled in a meeting for this purpose.

ATTITUDE OF COMMUNITY: (receptive, skeptical, hostile, etc.) This is a very recepti community to PBS reception. Not one unfavorable person was interviewed 20 community leaders contacted and assembled in a meeting. This communi definitely is seriously interested and intends to follow through to the completion of receiving PBS by way of satellite receiver and a translato of maximum possible power and coverage, so as to reach as much of the co as possible.

OTHER COMMENTS OR OBSERVATIONS: The next steps for Broadus, Mt.

1. PSSC technical assistance to determine VHF translator availability on Ch 8 or 13. VHF is much favored, but must be checked out by quali technical crew.
2. PSSC financial information. Possibilities of grants and etc.
3. Any further assistance PSSC can give to the eventual construction and operation of PBS reception.

Mail to: Dr. Louis A. Bransford
Public Service Satellite Consortium
4040 Sorrento Valley Blvd., Suite D
San Diego, CA 92121

Appendix F
Sample Site Survey Reports

August 21, 1978

FINAL REPORT Eastern Wyoming
SURVEY TEAM Flenniken and McMullen
SITES VISITED Medicine Bow, Burns, Lusk, Manville, Glendo, Glenrock Midwest, Edgerton, Sundance

I. Without fail, people seemed interested (if confused) about ETV/PTV, our visit and what was being expected of them. They were concerned about finances - most towns have other more pressing priorities such as streets and water - and our feeling was that they were rather covertly skeptical. There were varying degrees of enthusiasm, many statements of disaffection with commercial TV and a desire to see something else on "the tube." Because Wyoming currently has a Governor's Public Television Commission looking into the possibilities once again of a state system and a state authority, there seemed to be not only a desire for PTV, mainly as an alternative, but good interest in seeing a state system evolve which would provide a service to them without individual community initiative. And there were offers of help to convince state legislators to support such a system. We were well received everywhere by those who attended the meetings. Usually attendance was small.

II. A. General economy in most towns was poor, although a county may be relatively affluent. In most places, in fact, people reflected a county or area feeling in regards to PTV service rather than just their own community. In Sundance, school representatives said that if the school system put any money into such a project, it would have to serve all the schools in the district. That would be true in all school districts. Of course, if a community itself did something exclusive of the schools, that would not necessarily be the case, but it might be a concern.

B. More stable communities such as Burns, Lusk and Sundance expressed stronger interest and enthusiasm, it seemed. Such towns as Glendo (which can get PTV from a translator on Laramie Peak in case the tower isn't blown down), Midwest and Edgerton, all of which tend to be more transient in population makeup, are more narrowly interested. Yet it was at Midwest where there was an offer to do grass roots work for a state system.

C. Earth stations were not a viable alternative except for Midwest-Edgerton and Medicine Bow. At these towns, an earth station seemed to be the only alternative because of lack of signal and expensive microwave distances.

D. The penetration of PTV through CATV and translators (or possible penetration in the near future) was greater than anticipated, although signal strength and reliability tended to be erratic in the case of translators.

E. There was a general low awareness of what PTV is in the broad sense. In Glenrock, where the cable does carry PTV, people were still rather unaware, confused by the complex *TV Guide* listings, and felt the PTV signal was generally erratic and unreliable. Yet, upon checking with the CATV manager, we found his story about the signal to be absolutely different. He said the PTV signal had not "been out once in the past five weeks," although as a rule "signal quality coming into the system isn't as good as on some channels." We checked the signal out at the motel and PTV was there. In fact, the best cable signal we saw (given motel set differences) was in Glenrock.

F. In addition to getting signals to areas, there needs to be some way of increasing awareness of PTV. Again in Glenrock, the school representatives voiced a need in the community for knowing what is on PTV. Since

they seem to perceive PTV there as too erratic or unavailable for use in schools, what it boiled down to was that they really didn't know what was available and hadn't taken the time to check with the cable operator. In fact, the Mayor indicated that he had told Glenna Northrup when she called that there was no PTV because the signal was unreliable not because it was non-existant. Newspapers, community newsletters, and service organizations could be a viable option for transferring information about PTV and programs available.

G. Excepting only Manville and Burns, every community we visited had been contacted by cable companies or were already in the process of preparing franchise papers. This does not mean immediate service. In Lusk, the franchise has been held for 10 years. At this time it is fairly sure the service will be available in a year. The Mayor of Lusk remains very skeptical about when the system will be installed. We called the franchise holder and he assured us that he was in the process of surveying microwave sites that week, that KRMA out of Denver would be on the Lusk system, and that it would be in operation by spring.

H. Most towns had some expertise available to assist in maintenance of electronics (although no First Class License holders). Considering the condition of some of the translators, though, you wouldn't believe that. Land for locating facilities and assistance for installation was also available. Power seemed to be no problem anywhere.

III. Perhaps the area we covered is relatively unique. However, the present penetration of cable and translator is quite high. Because of energy related growth in the state, impaction is causing CATV operators to move ahead into previously unserved areas. The Satellite Cable Company plans certainly portend more commercial delivery of television into smaller underserved areas. Individual communities smaller than those being approached by CATV in this part of the state really do not have access to resources - funds and people - to do much

on their own, especially where off-air signals, whether transmitter, booster or translator, are not available without microwaving. Also, given the topography of hills, mountains, valleys, etc., the opportunities for service to larger areas than just single communities needs to be investigated more completely. Otherwise, cost effectiveness simply isn't there.

IV. The individual community plan does not seem very viable here. Banding together of several communities - i.e. all the towns in a county - so that not only is there a viewing alternative but an educational alternative as well would do more to further the PTV coverage and acceptance. Of course, a state system in Wyoming would generally make this effort moot anyhow. Any progress on a state system initiative will probably be evident by March of 1969. Regardless of this, however, unless there is more work done very shortly, and rather close contact maintained with the communities visited on this project, whatever interest the survey has aroused will die quickly. There is a certain amount of skepticism about surveys, federal programs, etc. among these people. So without quick, good follow up and continued initiative on the part of CPB/PSSC, not much will be accomplished toward PTV in this part of rural America.

Appendix F
Sample Site Survey Reports

FINAL SITE REPORT

Sundance, Wyoming
McMullen, Flenniken

Synopsis

One of the 2 best organized towns on this tour. Stable, good community spirit. High interest in school and education. Committed to improvement but cautious (i.e., swimming pool project moving slowly because of high cost and slow donations). A happy place, very friendly. Best solution would appear to be a translator system picking up Rapid City PTV....cable is coming to Sundance but not immediately.

Findings

General: Proximity to PTV in Rapid City and the fact that Sundance has a Television Association already in operation could make this one of the easiest sites to get the signal in.

Transmission Site: Two possible. Warren Peak for county-wide service to schools and surrounding communities. Might put Sundance in a shadow. Sundance Peak, just south of town, is where present translator is located and for immediate service to Sundance, it would be best. Power is available at both sites.

Small Earth Station: Appeared impractical due to signal proximity from Rapid City.

Mini-Transmitter: If CATV system does come in, a mini-transmitter might be located at CATV pick up point to serve wider area. A pick up of PTV signal from Terry Peak could be microwaved to the mini-transmitter on either Sundance or Warren Peak.

Cable System: Recent franchise request by Pine Bluffs Cable. If it comes in, it will carry KRMA and we suggested that their franchise include PTV service as a requirement.

Translator: They currently have 2 -- poorly maintained -- financed by community donations. (Many people pick up off-air signals from South Dakota stations and KTWO in Casper, depending on home antenna location.) No PTV!

Final Site Report
Sundance, Wyoming
McMullen, Flenniken

Local Origination:	Not much interest. Without cable, cost to transmitter would be high.
Financial Arrangements:	Machinery for supporting options may be there through the Sundan TV Association. Municipal funds not readily available now. School District input would depend on serving entire county. (Schools could not benefit completely without this coverage.) People would be very supportive of a state system.

3. Recommendations

A dual transmitter system -- 1 on Terry Peak and one on Sundance Mountain would be the best immediate solution for receiving PTV. This would also permit wider coverage of the area....Hulett and Moorcroft. If Warren Peak can get a signal down into Sundance, it would be a superior location, based (again) on wider coverage area.

Cable television into Sundance would alleviate the need for translator, i.e., Sundance should try to encourage operator. Still, county wide coverage would be important for maximum use of PTV in the area.

Appendix F - Sample Site Survey Reports

COMMUNITY PROFILE

uctions: Information requested below may be submitted in narrative form. The purpose is to record subjective data on the community itself and your impressions, observations, etc. as a result of the visit. This report is DUE WITHIN 3 DAYS of the site survey.

nity Name: Sundance, Wyoming   Date of Site Survey: 8/18/78

y Team: Flenniken

McMullen

IPTION OF INTERVIEW: (names of people interviewed, their position in the community, duration of interview, setting, discussion, etc.)

eeting was a luncheon at the Aro Cafe. Nine representatives attended (see attached) ding the mayor, city council, school superintendent, principal, chamber of commerce and senior citizens representatives. The meeting lasted 1½ hours. (Formally). ssion centered on recent developments with cable, alternatives for service and uses V for the various groups at the meeting. A well organized, ambitious and positive ng.

IPTION OF COMMUNITY: (significant or unique characteristics -- may include population, geographic, economic, political, educational, resources, etc.)

nce is nestled in the Black Hills region. As such tourism is fairly active here in the r. The population is extremely stable. (Popham from the electric company says 1 person s company every 4-5 years.) There is no concentrated industry. Town is a multi-service nity to ranching, energy, and forest services. Topography is a problem - It's a hole, unded by the Black Hills. Education (Adult, continuing, and public) is a high priority

---

UDE OF COMMUNITY: (receptive, skeptical, hostile, etc.)

RECEPTIVE. After a bad experience in Midwest-Edgerton, it was really neat to see a nity involved: not only in PTV, but in their whole community's progress. They are g to raise $350,000 for an indoor swimming pool - they are having a tough time doing ut they are committed to it. Given some directions and guidance, there is no question the project's success in Sundance!

COMMENTS OR OBSERVATIONS:

e above doesn't say it, Sundance is a great place. The people are very receptive. They xtremely happy here, but anxious to improve the community. They have a "Sundance TV iation" which has placed translators on Sundance peak. The mechanism is there to add ut of Rapid City or to support other alternatives. Just sorry Glenna didn't comere here ad of Midwest/Edgerton. You'd love it here Glenna, really!!

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to: Dr. Louis A. Bransford
Public Service Satellite Consortium
4040 Sorrento Valley Blvd., Suite D
San Diego, CA 92121

Appendix F
Sample Site Survey Reports

FINAL REGION REPORT

WESTERN WYOMING

LOIS AND RAY ANDERTON

1. COMPOSITE OBSERVATIONS

Because the communities differed in size, economy, degree of isolation, and life style, it is difficult to make composite observations, except to note that the people from all eight areas were flattered to have been selected for the survey, and they enjoyed answering questions about their communities. All eight communities would like to receive public television, but not all eight could fund the project.

2. FINDINGS

The people of six of the eight communities were very excited about public television programming and wanted very much to be able to receive public television. The two areas where the responce was less than enthusiastic were Burlington and Hyattville. As has already been detailed in earlier reports, the Burlington people who attended the meeting were not representative of the residents of the area, and the Hyattville people had misunderstood the purpose of the meeting and were very disappointed to learn we were not sent there to bring them commercial television.

Those living in the four larger communities--Afton, Shoshoni, Ten Sleep, and Mammoth--want very much to bring PTV into their areas, are able and willing to provide some funds, and are anxiously awaiting word from PSSC to see what their next steps should be.

The people from Manderson and Pavillion--both small, poor communities dependent on agriculture--want PTV but know their populations are too small and their people too poor for them to be able to raise the needed funds themselves. The people of Manderson are so determined to get PTV that they plan to try to get help from their state government.

The only hindrance to bringing PTV into any of the communities is the shortage of funds. Six of the eight want PTV very much, and the other two would gratefully accept it if money were not a problem.

According to Dail Ogden, whom Ray telephoned in Denver, and to Bill Huffman of Mammoth, the terrain and distances to be covered would not cause serious problems, so every community could receive PTV via a small earth station and a 10 watt or 100 watt mini-transmitter. Every site had at least one location, complete with available power, amenable to an earth station and mini-transmitter. There is a possibility the signal could be brought to Afton via translator. If that can not be done, then they would consider building an earth station.

GENERALIZATIONS

As stated previously, we expect the people of the four larger communities--Afton, Shoshoni, Ten Sleep, and Mammoth--to carry through with the project with the guidance of PSSC and eventually receive PTV.

The other four communities were very small and very poor. Instead of being surprised that there was little enthusiasm for

fund raising in two of the four, we should probably be surprised that positive steps were taken in the other two. Pavillion, Manderson, Burlington, and Hyattville consist mostly of retired ranchers living on small fixed incomes and landless agricultural laborers. In population, those towns are 181, 150, 100, and 54, and most of the residents had never heard of public television before our visit. Even after telling them of the possibility of matching funds, to expect 100 people to donate upwards of $20,000 to see a type of television they have never heard of is asking a lot. And yet, in two of those small communities, the reaction was not just polite but enthusiastic.

We don't know if PSSC plans to visit other sites in the future. If expansion is planned, we have a few more generalizations to offer in the way of suggestions about selecting other sites:

1) Quite a few communities in Wyoming center around an active Church of the Latter Day Saints. Generally, the church members support PTV because of the educational programs for children and because many of the programs can be viewed together by the entire family. If this study is expanded, it might be wise to seek Mormom communities.

2) Apparently by coincidence, nearly every site we surveyed was nearly lily white. There must be some communities in Wyoming with more minority groups. Unless those areas were eliminated because of economic factors, it would be nice to include them as future sites.

3) Very small, unincorporated areas dependent on agriculture

cannot build an earth station. Unless more than just matching funds will be made available to such areas, it seems to be a waste of our time and theirs to generate their enthusiasm for something they cannot afford.

4) Wyoming is experiencing an energy boom with millions of new dollars coming into the state, but we visited only one town--Shoshoni--that is profiting from it. If the goal is to locate towns that will invest funds in PTV, more communities near oil fields, gas fields, or uranium mines should be visited.

5) We hear that Anderton and Anderton make a great team, and if this study is expanded in Wyoming or elsewhere they would be interested in conducting further surveys.

Appendix F
Sample Site Survey Reports

FINAL SITE REPORT

Ten Sleep, Wyoming
Lois and Ray Anderton

1. Synopsis

Ten Sleep, like the other Mormon communities we visited, had a large numbe of people who want PTV because they want programs the entire family can watch together. They are very dissatisfied with both the quality of the programming and the quality of the reception on their present TV channels.

Most people had never heard of public TV before, but they were receptive once they understood what it was.

The community includes many ranches that were not covered by the 100 watt overlay. After visiting Ten Sleep, we phoned Dail in Denver and learned that the actual signal reaches much farther than the overlay indicates.

A cable company charged them a great deal of money several years ago and then did not meet its promises, so the people were a little cautious.

Twenty-three friendly, warm people attended the meeting and seemed to leave with the feeling that PTV would be good for their community.

2. Findings

They get a direct signal from Thermopolis, so there is no existing translator. There is a hill less than a mile southeast of town with power available that would be a good site for the mini-transmitter. The earth station could be built at the base of the hill.

The nearest cable is 28 miles away at Worland. Because they were cheated by a cable company they are not interested in cable TV. They are also not interested in local origination.

They said they would be interested in supporting public television financi and would create a fund raising organization. However, money is very scarce in the community.

3. Recommendations

We gave a very conservative estimate of the distance the 100 watt signal would travel. Later, when we talked to Dail, he told us the signal would easily include the outlying ranches. Perhaps in future correspondence they

could be told we were too conservative in our estimate.

Mayor Shriver asked that another contact person be designated. Archie McCalla was chosen. Please direct future correspondence to him:

Mr. Archie McCalla
Box 31
Ten Sleep, Wyoming

If the people of Ten Sleep continue to be as enthusiastic about PTV as they became the night of our meeting, they will probably build an earth station and 100 watt mini-transmitter.

COMMUNITY PROFILE

Instructions: Information requested below may be submitted in narrative form. The purpose to record subjective data on the community itself and your impressions, observations, etc. as a result of the visit. This report is DUE WITHIN 3 DAY of the site survey.

Community Name: Ten Sleep, Wyoming   Date of Site Survey: 8/8/78

Survey Team: Lois Anderton

Ray Anderton

DESCRIPTION OF INTERVIEW: (names of people interviewed, their position in the community, duration of interview, setting, discussion, etc.)

Twenty-three people met with us in the town hall, including the mayor and superintendent of schools. Several people were familiar with public television and spoke out in favor of it. Their questions were positive and to the point. We discussed cost and the possibility of matching funds from a government agency or private foundation, stressing that the funds have not been committed yet. The people seemed willing to start a fund raising drive as soon as they hear from PSSC.

DESCRIPTION OF COMMUNITY: (significant or unique characteristics -- may include population, geographic, economic, political, educational, resources, etc.)

The neighboring ranches are very much a part of the community and the people feel that a larger area should be included than can be covered by a 100 watt mini-transmitter. The community is not economically depressed.

ATTITUDE OF COMMUNITY: (receptive, skeptical, hostile, etc.)

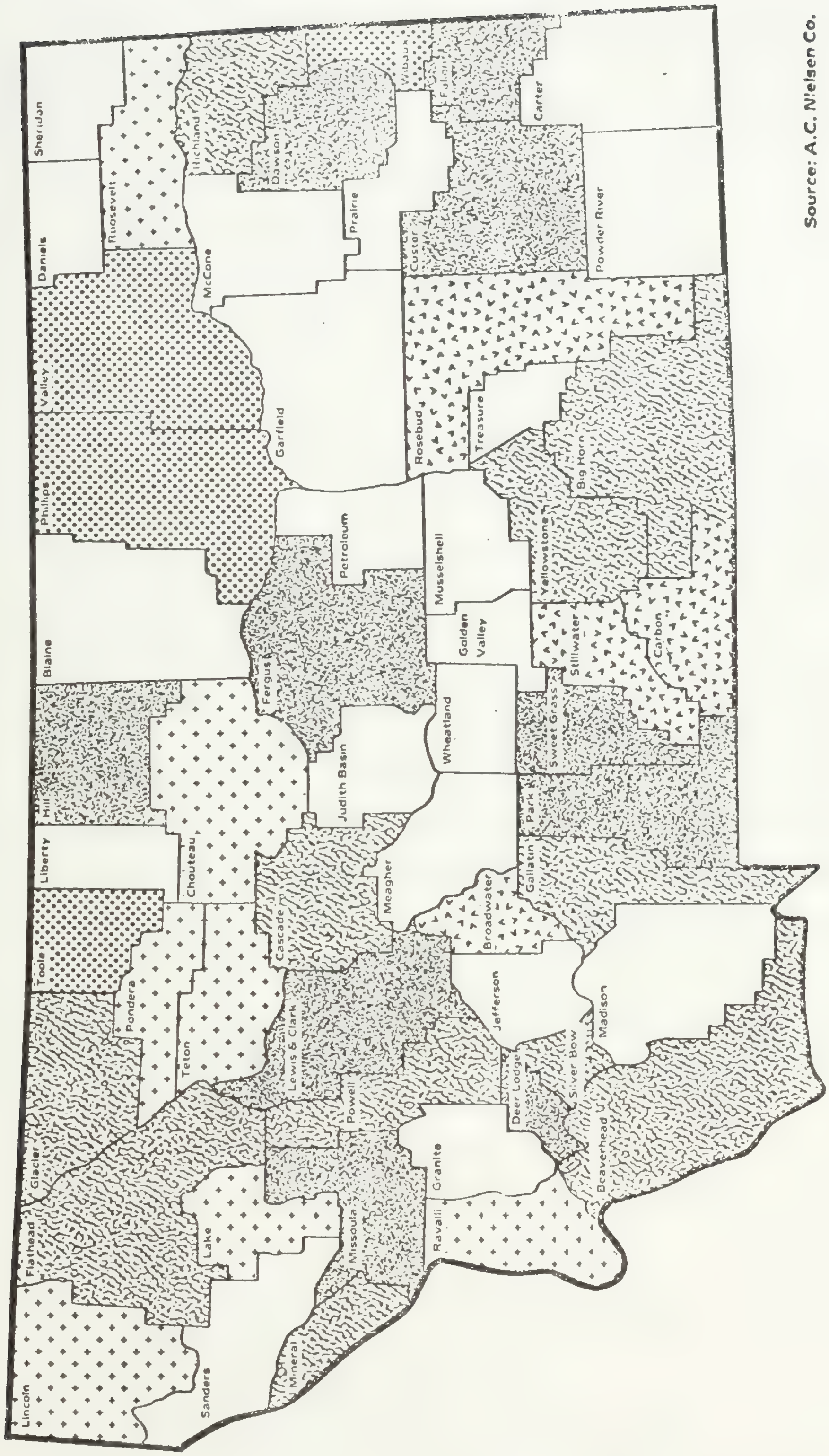
This was a friendly, enthusiastic, receptive group of people. They are already talking of forming committees and starting fund raising drives. A few people were not interested in PTV programs, but many want good programs for family viewing.

OTHER COMMENTS OR OBSERVATIONS:

Twelve years ago they paid $160 per family to a cable company that did not live up to its promises. Reception was terrible and after 2 or 3 years the company took the cable down from telephone poles and left the people with a big financial loss and very poor reception.

Mail to: Dr. Louis A. Bransford
Public Service Satellite Consortium
4040 Sorrento Valley Blvd., Suite D
San Diego, CA 92121

Montana Cable Penetration
July 1980



Source: A.C. Nielsen Co.

Nielsen Estimates of Cable TV Penetration by County in Percentage

- Less than 5 percent penetration
- 5 percent to 14.9 percent penetration
- 15 percent to 24.9 percent penetration
- 25 to 34.9 percent penetration
- 35 to 49.9 percent penetration
- 50 to 69.9 percent penetration
- 70 percent and over penetration

Source: A.C. Nielsen Co.

VIII. BRIEF REVIEW OF APPLICABLE FCC REGULATIONS

A. Translators

a. Maximum VHF Translator Power

1. One Watt East of the Mississippi River
2. Ten Watts West of the Mississippi River
3. 100 Watts on an Assigned Channel

b. Maximum UHF Transmitter Power

1. 100 Watts
2. 1000 Watts on an Assigned Channel

c. No Limitations on ERP and Antenna Height by FCC. However, considerations must be given to FAA (Federal Aviation Administration) air-space restrictions

d. Unattended Operation Permissible, Provided:

1. If translator cannot be reached at all hours and in all reasons, means shall be provided so that the transmitting apparatus can be turned off and on at will from a remote which is readily accessible at all hours and in all seasons
2. The translator shall be equipped with suitable automatic circuits which will place it in a non-radiating condition in the absence of an input signal
3. The translator apparatus and the on-off control (if at a location other than the translator site) shall be adequately (locked) protected against tampering by unauthorized persons

e. Technical Personnel Requirements

1. Second-class operators license required if adjustments are to be made which affects emission
2. Operators license not needed by installor of FCC Type accepted equipment but must have sufficient skill to follow manufacturers instructions
3. Simple maintenance such as the replacement of tubes, fuses, or other plug-in components and adjustments which require no particular technical skill may be made by an unskilled person (underlining added)

4. FCC must be supplied with the name, address and telephone number of a person or persons who may be contacted to secure suspension of operation should such action be deemed necessary by the FCC

f. Co-Channel and Adjacent Channel Mileage Separation Requirements (See Section 74.702 of the FCC Rules and Regulations)

g. Translator Station Identification Requirements
Either:
1. Automatic identification in international morse code at least once per hour, or;
2. By arranging for the primary station to transmit an identification as per Section 74.783(a)(2) of the FCC Rules and Regulations

B. Mini-Transmitters

a. No provisions in the FCC Rules and Regulations for operating mini-transmitter. Therefore, for licensing purposes it will be possible to consider licensing under the following options:
1. Translators with provisions for local origination (a waiver of the rules will be required with this procedure since the current rules limit local origination (as a mini-transmitter) to UHF translators broadcasting still photographs, slides, and recorded voice announcements
2. As an experimental television broadcast station under Subpart A Section 74.101 of the FCC Rules and Regulations
3. A successful petition to change the FCC Rules and Regulations to regularize mini-transmitters under a set of rules similar to the current rules governing translator operation

IX. AIR SPACE CONSIDERATIONS FOR TOWERS

A. A tower can be constructed without FAA approval provided the overall height of the structure does not exceed any nearby natural elevation by more than 20 feet

B. FAA approval needed for almost all towers near airports

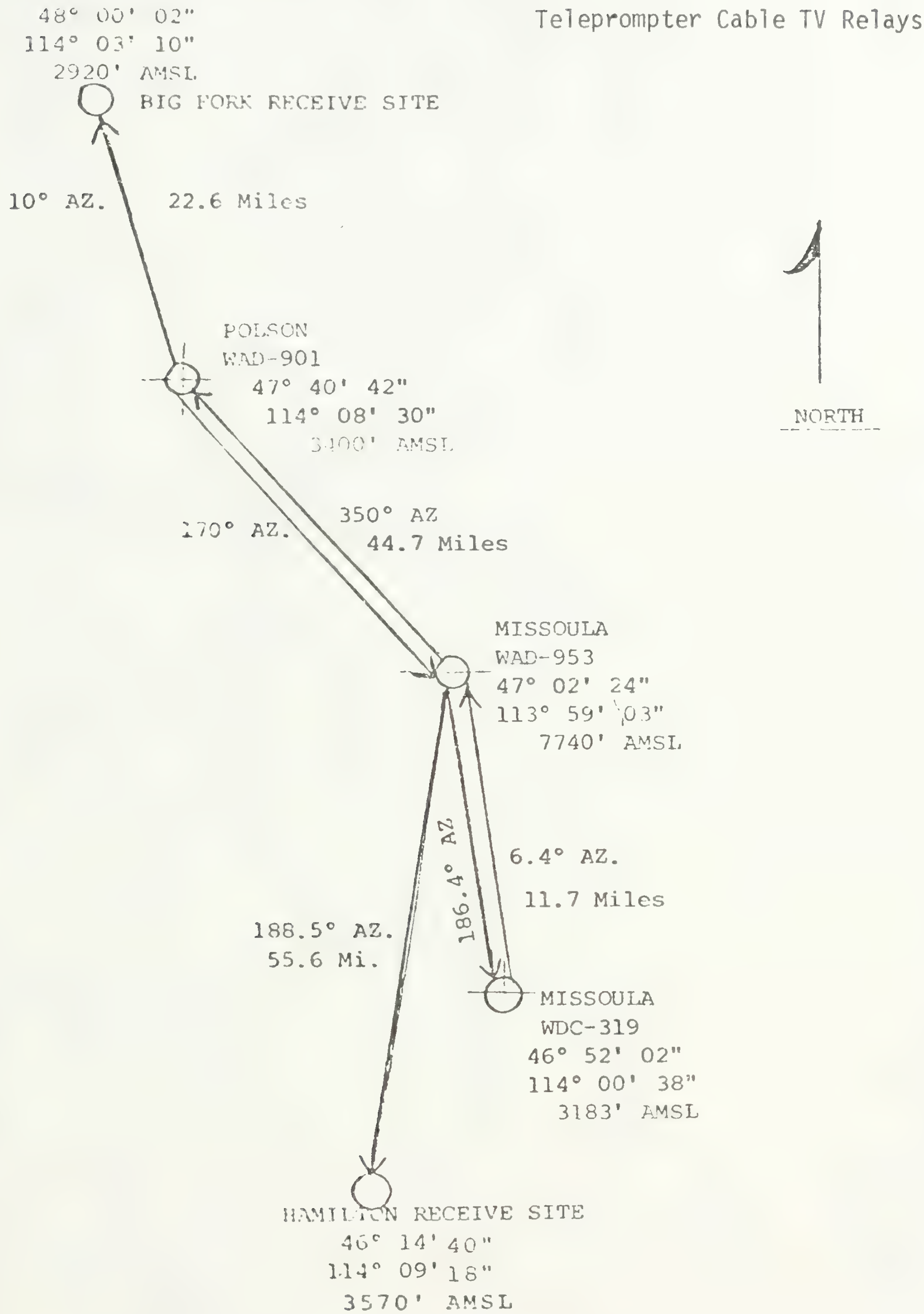
C. Detail criteria found in Federal Air Regulations Part 77 "Objects Affecting Navigable Air Space"

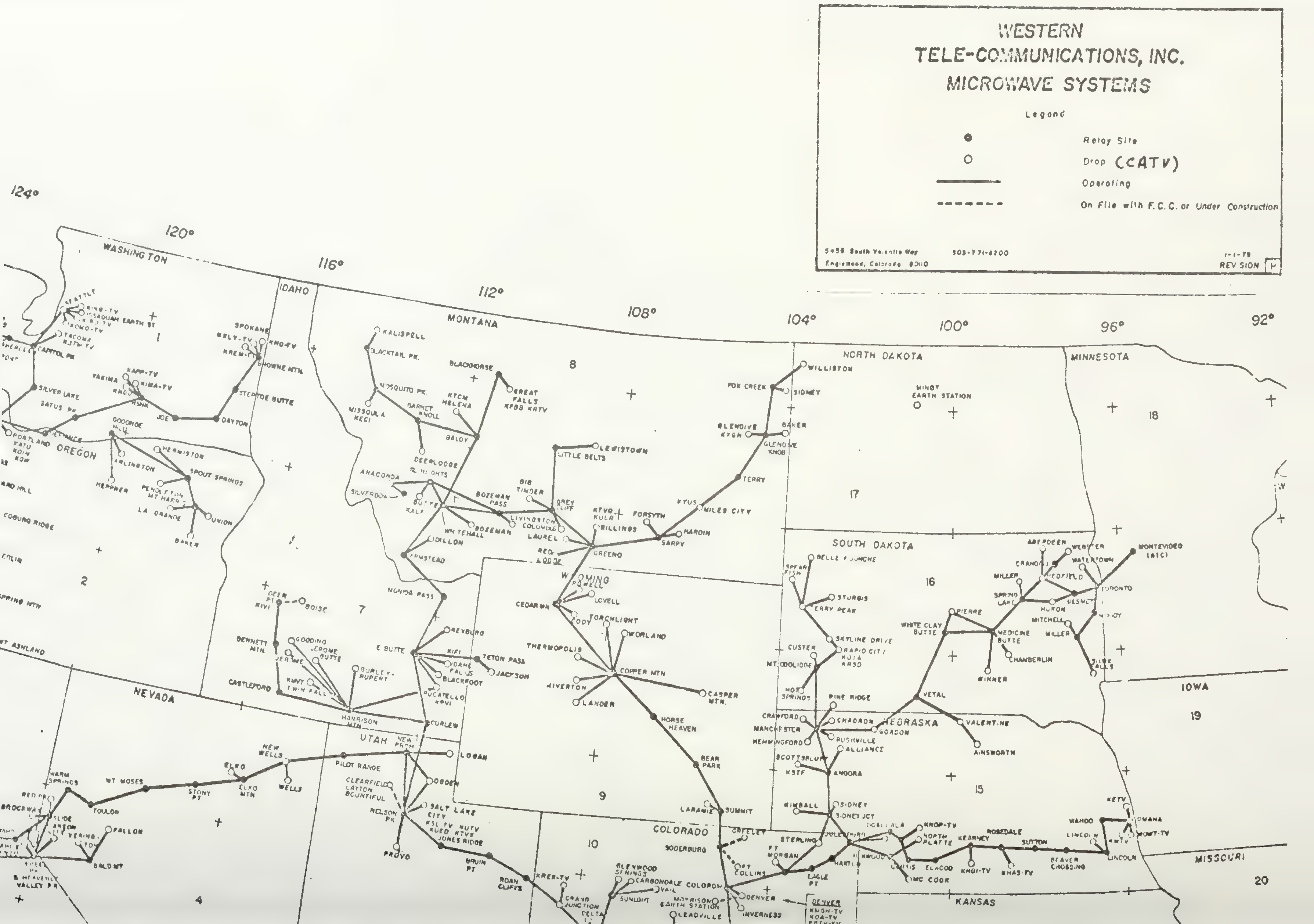
D. Excerpts from the Federal Aviation Regulations Part 77 of the most important criteria appears on the front (yellow page) of FAA Form No. 7460-1 "Notice of Proposed Construction or Alteration"

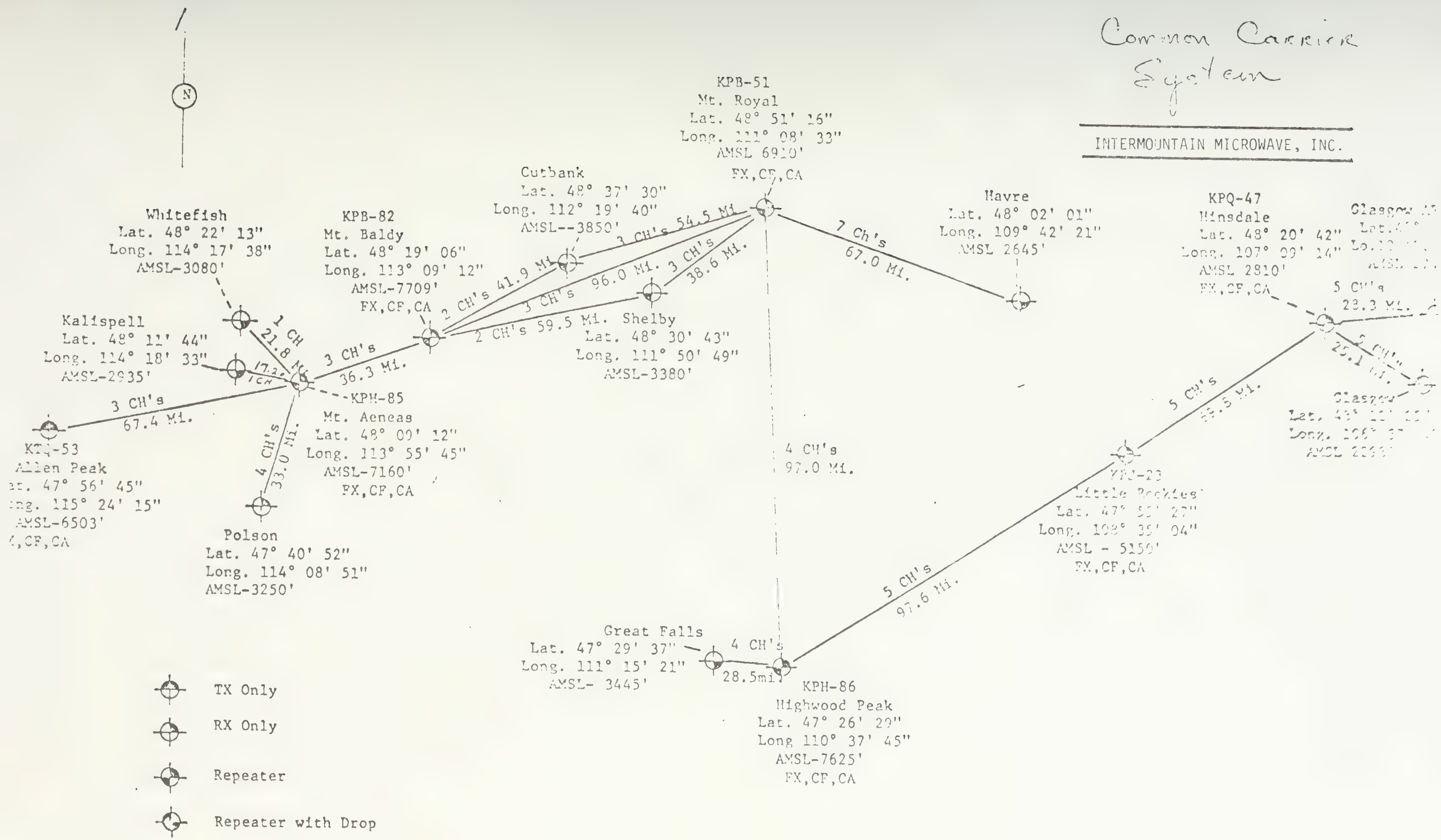
MONTANA CARS SYSTEM MAP

ATTACHMENT C

Teleprompter Cable TV Relays




WESTERN
TELE-COMMUNICATIONS, INC.
MICROWAVE SYSTEMS
Legend
Relay Site
Drop (CATV)
Operating
On File with F.C.C. or Under Construction
5455 South Valentia Way
Englewood, Colorado 80110
303-771-8200
1-1-79
REVISION H
WASHINGTON
IDAHO
MONTANA
OREGON
NEVADA
UTAH
WYOMING
COLORADO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
MINNESOTA
IOWA
KANSAS
MISSOURI
124°
120°
116°
112°
108°
104°
100°
96°
92°
SPOKANE
KALISPELL
BLACKTAIL PK.
MISSOULA
BLACKHORSE
GREAT FALLS
HELENA
BUTTE
ANACONDA
DEER LODGE
BOZEMAN
BOZEMAN PASS
LIVINGSTON
BIG TIMBER
LEWISTOWN
LITTLE BELTS
BILLINGS
FORSYTH
MILES CITY
TERRY
GLENDIVE
BAKER
FOX CREEK
WILLISTON
SIDNEY
MINOT EARTH STATION
BOISE
TWIN FALLS
HARRISON MTN
POCATELLO
BLACKFOOT
IDAHO FALLS
REXBURG
TETON PASS
JACKSON
E BUTTE
MONIDA PASS
DILLON
CEDAR MTN
POWELL
LOVELL
CODY
TORCHLIGHT
WORLAND
THERMOPOLIS
COPPER MTN
RIVERTON
LANDER
CASPER MTN.
HORSE HEAVEN
BEAR PARK
LARAMIE
SUMMIT
GREELEY
FT COLLINS
DENVER
INVERNESS
LEADVILLE
VAIL
GLENWOOD SPRINGS
GRAND JUNCTION
STERLING
FT MORGAN
SALT LAKE CITY
OGDEN
LOGAN
PROVO
PILOT RANGE
ELKO
WELLS
MT MOSES
TOULON
FALLON
PIERRE
STURGIS
RAPID CITY
CUSTER
HOT SPRINGS
ABERDEEN
WATERTOWN
HURON
MITCHELL
MONTEVIDEO (ATC)
CHADRON
ALLIANCE
SCOTTSBLUFF
KIMBALL
VALENTINE
AINSWORTH
NORTH PLATTE
KEARNEY
LINCOLN
OMAHA
WAHOO
TACOMA
SEATTLE
YAKIMA
PORTLAND
HERMISTON
SPOUT SPRINGS
LA GRANDE
UNION
BAKER
DAYTON
STEPTOE BUTTE

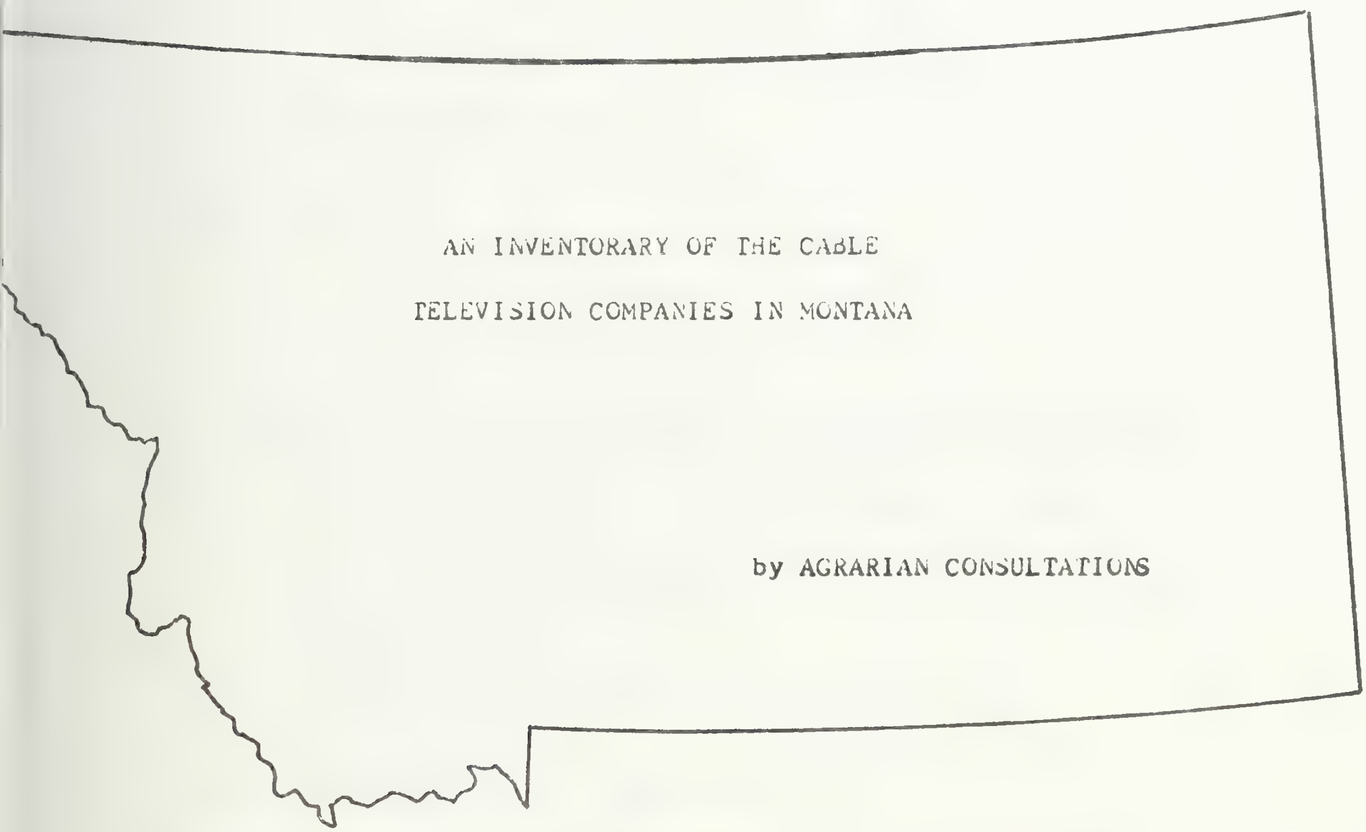


Common Carrier System
INTERMOUNTAIN MICROWAVE, INC.
N
KPB-51
Mt. Royal
Lat. 48° 51' 16"
Long. 111° 08' 33"
AMSL 6910'
FX,CF,CA
Cutbank
Lat. 48° 37' 30"
Long. 112° 19' 40"
AMSL--3850'
Havre
Lat. 48° 02' 01"
Long. 109° 42' 21"
AMSL 2645'
KPQ-47
Hinsdale
Lat. 48° 20' 42"
Long. 107° 09' 14"
AMSL 2810'
FX,CF,CA
Whitefish
Lat. 48° 22' 13"
Long. 114° 17' 38"
AMSL-3080'
KPB-82
Mt. Baldy
Lat. 48° 19' 06"
Long. 113° 09' 12"
AMSL-7709'
FX,CF,CA
Kalispell
Lat. 48° 11' 44"
Long. 114° 18' 33"
AMSL-2935'
KPH-85
Mt. Aeneas
Lat. 48° 09' 12"
Long. 113° 55' 45"
AMSL-7160'
FX,CF,CA
Shelby
Lat. 48° 30' 43"
Long. 111° 50' 49"
AMSL-3380'
Allen Peak
Polson
Lat. 47° 40' 52"
Long. 114° 08' 51"
AMSL-3250'
Great Falls
Lat. 47° 29' 37"
Long. 111° 15' 21"
AMSL- 3445'
KPH-86
Highwood Peak
Lat. 47° 26' 29"
Long 110° 37' 45"
AMSL-7625'
FX,CF,CA
Long. 108° 39' 04"
AMSL - 5150'
FX,CF,CA
7 Ch's
67.0 Mi.
3 CH's 54.5 Mi.
2 CH's 41.9 Mi.
3 CH's 96.0 Mi.
3 CH's 38.6 Mi.
2 CH's 59.5 Mi.
1 CH
21.8 Mi.
3 CH's
36.3 Mi.
3 CH's
67.4 Mi.
4 CH's
33.0 Mi.
4 CH's
97.0 Mi.
4 CH's
28.5mi
5 CH's
97.6 Mi.
5 CH's
5 CH's
23.3 Mi.
TX Only
RX Only
Repeater
Repeater with Drop

LOCATIONS FOR VIDEO DELIVERY BY MOUNTAIN BELL

Billings	Helena
Bozeman	Lewistown
Butte	Livingston
Conyon Ferry	Malta
Conrad	Miles City
Culbertson	Missoula
Cutbank	Opheim
Deer Lodge	Plains
Dillon	Plentywood
Forsyth	Roundup
Glasgow	Scoby
Glendive	Shelby
Great Falls	Sidney
Hamilton	St. Regis
Hardin	Thompson Falls
Harlem	W. Glacier
Havre	W. Yellowstone
	Wolf Point

ATTACHMENT D



AN INVENTORARY OF THE CABLE

TELEVISION COMPANIES IN MONTANA

by AGRARIAN CONSULTATIONS

IAN CONSULTATIONS

BOX 547
HARLEM, MT 59526
(406)353-4922

enheuser

June 1, 1981

Mr. A.E. Clifford, Director
Montana Telecommunications Project
Room 227
Mitchell Building
Helena, MT 59601

Dear Mr. Clifford:

Attached to this letter of promulgation is the final report for the Proposal to Inventory the Cable Television Companies in Montana. The report consists of ten sections:

1. Inventory of receiving and transmission systems
2. Production capabilities
3. Test and monitor equipment, and miles of plant
4. How a cable system works
5. Programs offered
6. Future expansion plans
7. Managerial and technical strength
8. Specific problems
9. Gross revenues
10. Presentation to a task force

During the requirement phase of this proposal section nine was not reported on due to the competitive nature of the cable television industry. Such a task would have placed this entire proposal in jeopardy.

Several of the above requirements are supported with schematic and serial documentation in the appendix.

Agrarian Consultations is confident that this document will prove instrumental to future planning efforts regarding the growth of telecommunications in Montana. Please feel free to contact me should you have any questions regarding this study.

Sincerely,

Charles Bickenheuser

CB:ak

Attachments

I N D E X

page

REQUIREMENTS

APPENDIX

INTRODUCTION

Montana is moving, as are several other states, into the deployment and usage of telecommunications to effect a greater citizen response to business and government policies and decisions. A necessary first part of this task is to inventory the present communications systems within the state. As such, the inventory of Montana's cable television systems was one of several such systems to be inventoried. (Some other systems were commerical radio and television broadcast stations, land mobile, amateur radio and the like.) Accordingly, this proposal seeks to inventory most, if not all, of the cable systems in Montana. The information, reported in totals without reference to any single system, will be used for the design and implementation of future telecommunication systems in the state.

Agrarian Consultations wishes to thank the many individuals who gave so generously of their time, without whom this study could not have been done. In the interest of confidentially individuals cannot be thanked by name; though the thanks expressed is no less sincere even if given in general. Special thanks to the Montana Telecommunications Project Office and in particular to its director, Mr. A.E. Clifford.

EXECUTIVE SUMMARY

The purpose of this study was to carry out a comprehensive inventory and analysis of the cable television systems in Montana. This study fulfills part of a federal grant to the State of Montana to inventory and analysis the current use of state communications and develop a mulit-mode and multi-model telecommunication system for both our private and government areas as applied to the needs and capabilities of Montana residents.

Of the known 49 cable systems in Montana nine were inventoried on site and the remaining systems were inventoried by telephone. Without exception all of the systems had just completed a major expansion or were planning a major expansion in the next several months to a year. In some systems this included a rebuild to increase bandwidth for additional programing or simply the addition of more channels to the present system.

Managerial strength is strong with the average years of experience in cable television systems 10.40 years (standard deviation, or s.d., of 7.33) with the range from more than 26 years to just a few months. Technical strength is also strong with 47 percent of the technicians having received formal training in a technical school. Also 38 percent hold either a 2nd or 1st class FCC license. 22 percent gained

their technical training with on the job training without any prior, and formal, training. Technicians with a bachelors degree number six percent of the total and technicians who received electronic training in the armed services account for 28 percent of the total.

Those systems that are locally owned and operated tend to have smaller staffs and are located in the smaller towns of the state. In general their supporting populations are less than four thousand staff varies from two to five people. Multi system organizations (MSO's) are located in towns that have the larger populations in the state. Their staffs vary from five to twenty or more people employeed.

With the exception of local time and temperature channels and character generators locally programed Montana cable systems do not originate local programs. The one exception to this rule, more or less, is that one MSO has a portable production unit that can record video on three-quarter inch cassette. This portable unit is housed in a small trailer and is in use for legislative interviews during state sessions. The recorded tapes are then sent through the mail system in round-robin fashion for local play at each of the stations belonging to this particular MSO.

All of the MSO's can call for production equipment that is housed outside of the state. As a general rule this is use for program promotion on an infrequent basis.

This study found that management was enthusiastic about their work, the employment of recently introduced technôlogy, system expansions and the addition of new programs. Most, if not all, shared an excitement in working with satellite systems. Some systems reported that supplies were longer in being deleivered, as a result of the rapid growth of cable systems in all of the states. Half of the systems reported a shortage of technical personnel.

Confidentially demands that the totals in the requirement sections be reported as a whole. It is the intention of this study that single stations, or individuals, not be identified. Such information as this report collects is not intended to give a market edge in the growth or sale of cable systems and this restriction does not interfere with the goals of the report; namely the future planning of telecommunication systems in Montana.

BACKGROUND

The past fifteen years have seen an incredible use of telecommunications systems in both government and private business. Cost reductions are on the order of one thousand to one. This trend towards audio and data telecommunication links has not yet reached its limit: in fact, it is just beginning. The social and economic facts of ever increasing telecommunication links demonstrates the publics need for more information and cost effective communications. In this regards Montana is now beginning to consider the use of telecommunications for its citizens. Recognizing the increased need to make more information and communication channels available Montana is planning for the future use of telecommunication systems that will give the 'person on the street' access to public officials and information that is now time consumming, often prohibitively so.

When any state or large organization begins this task one of the first items to be completed is an inventory of existing communication systems. Often sophisticated communications exist but are specialized for a particular usage and not for the general public. As a large, state wide, telecommunication system in the future would be to costly to deploy as an 'inhouse system' the use of existing communication systems, such as phone lines, launched

satellites, microwave links, television studios and the like, will be utilized as contract services and for technical and managerial support. Though online implementation is not without struggles the benefits, several times over, to the general public are substanistal and nourishing.

The use of video transmission systems in any future telecommunication system for the general public in Montana, especially one way, receive only video (except, of course, for the site of origination) of the type presently found in Montana's cable systems can be a valuable contribution. It is for this reason that this study, to inventory the states' cable systems, was undertaken. Not only were the technical transmission and receive aspects inventoried but also the technical and managerial skills were noted: for it will be the technicial and managerial skills of Montana residents in the cable systems that will make the use of video telecommunications for the general public successful.

It is the successful and useful experience of other states in the deployment of public telecommunication systems, such as the Alaskan system, and the need for such systems in Montana, that prompted this sutdy. The report follows.

INVENTORY OF RECEIVING AND TRANSMISSION SYSTEMS

Cable systems in Montana receive programs from three seperate transmissions systems: 1) satellite, 2) microwave and 3) off-air transmissions from local television broadcast stations (which is a requirement of the FCC). Additional programing can be taken from either video tape delay or local origination cameras; however, more than 98 percent of all programs received are taken from the first three systems. Specifically, 42 percent of received programs are from satellite down links, 35 percent are off microwave links and 23 percent of the total (not counting local time and temperature channels) are local, off-air broadcast stations.

All but four cable systems have a parabolic antenna for receiving satellite transmissions. 83 percent of the systems have either a 4.5 or 5.0 meter parabolic dish with the range between 4.5 meters to 10 meters. 98 percent of the cable systems inventoried have a single dish; the remaining two percent have two satellite antennas for those systems receiving direct satellite transmissions.

The transmissions systems that the cable systems themselves use to deliver their programs to local customers will covered in the

section entitled How a Cable System Works.

PRODUCTION CAPABILITIES

Production capabilities of most Montana cable systems are limited: only six percent of the systems can produce and air a program, either live or tape delayed, with equipment presently in the state. These are two camera studios with video editors, mike mixers, lights, character generators, and limited special effects (for split screen and fade to black). There is a portable studio in use on an infrequent basis: generally this is for legislative interviews every other year. Also one MSO can call of production equipment that is used between several states. When this MSO equipment is used in Montana it is for local program promotion to increase system subscribtions.

For the most part several stations (36 percent) air local 'time and temperature' status. This is done with a black and white camera that scans analog readouts of current weather conditions. Eleven percent of the systems have character generators locally programed. In general these are simple (less than 4,000 character memory) keyboard programmable units. Slightly less than a quarter of the systems (21 percent) have either a video tape player or recorder for

three-quarter inch cassette. Systems having both a video tape player and a character generator are eleven percent of the total.

The majority of Montana systems do not originate local programs of any type (time and temperature, delayed video, production studio). These systems number 64 percent of the total systems.

TEST AND MONITOR EQUIPMENT, AND MILES OF PLANT

All of the systems preform preventive maintenance and slightly more than half repair most equipment failure. Seven percent of the systems inventoried repair major equipment failures on site. 47 percent of the systems must send non-functioning equipment to another location in the state, or out of state, for repair as the technical skills and bench equipment are not on site.

As the radio spectrum in the four to six gigahertz is used to receive satellite and microwave signals for cable systems troubleshooting and repair of equipemnt operating in these frequencies demands sensitive and expensive bench test equipment and good technical skills only recently (in the cable television market) needed. For this reason MSO's have a regional repair office and independent systems send their equipment out rather than repair on site. Also, the down time of solid state, intergrated circuits is much less than the older gen-

eration of vacuum tube sets. This fact makes the purchase of expensive bench equipment for testing and repair not necessary for the smaller systems. Most systems, both small and large, have equipment that measures line levels, or signal strength, in the range of 50 to 170 megahertz and the audio range of 300 to 15, 000 hertz. This equipment is fairly inexpensive and can be used without a high degree of technical training.

Total miles of plant, or total miles of cable presently serving Montana cable subscribers, inventoried are 2564. The number of households connected to all Montana cable systems is 126,356. The number of households that could be connected to the present television cable system could be increased by as much as thirty percent without the addition of more transmission cable.

HOW A CABLE SYSTEM WORKS

A cable system works with the interweaving of managerial and technical skills. (See appendix pages A, B and C) Managerial organizations of the smaller stations varies from two to five people whereas the larger stations employee from five to twenty or more people. A generalized management block diagram for the smaller stations (Appendix A) shows that the system manager is in direct control of all system functions with very little auth-

ority being delegated to other staff except routine office procedure. It is important to note the the manager most likely is the chief technician also; in fact he may be the only technician. This is in contrast to the larger systems where the manager may or may not have a technical background, though in most systems the manager does have a technical history.

Other differences to note are that all of the larger systems are owned, at least in part, by a parent coporation. In contrast the smaller stations may or may not be owned by another corporation. (Appendix B)

Clearly cable systems hire whom they need in the way of personnel and what they can in terms of salary. If the system is large tasks are delegated to assistant managers or chief technicians. 26 percent of the systems have their billing computerized. Eleven percent have their inventory computerized in addition to their billing. Only one system has an in-house computer system; other systems use an out of state computer company (specializing in cable television systems) for batch processing.

As mentioned in the executive summary managerial strength is strong with the average manager having 10.40 years in the cable tele-

vision business. The range was from 26 years to just a few months. All of the managers were enthusiastic about their work and the cable television business. Working with satellite technology added excitement to the job. 'Espirit de corps' is strong for both small and large systems.

The technical aspects of a cable system are divided into three areas: 1) receiving the program signal, 2) feeding all of the program channels into the transmission line and 3) the transmission line itself. As mentioned in the section entitled Inventory of Receiving and Transmission Systems 98 percent of the programs are received either from satellite, microwave or off-air sources. For satellite or microwave programs (or channels) an antenna system is used to recover low power (generally less than ten watts) signals. A parabolic antenna, or "dish", is employeed at this antenna develops excellent gain (or amplification) of the received signal over beam antennas. Parabolic antennas can also be used as the received signal (four to six gigahertz) is a very short signal in its length of wave. (A signal of four gigaherts is less than three inches in length.) Parabolic antennas also receive less noise than beam antennas making the received signal 'purer'. The signal is captured by the parabolic antenna and feed into a receiver that increases its strength. This signal is then feed into a modulator that converts the four to six gigahertz signal to a lower frequency that can be used, ultimately,

by the television sets in the home of the subscriber. Microwave signals are received in the same way as satellite transmissions, except, of course, that the origin of the signal a cable company receives is from a land based system instead of a satellite. (Appendix C)

Off-air signals, from local broadcast stations, are captured on a beam antenna (their wave lengths are 18 to five feet in length) and feed into a signal processor that both increases, or amplifies, the received signal and, most often, modifies the frequency for use in the cable system. Some off-air signals are captured and amplified in the received frequency.

In Montana less than two percent of the programs originate from video delay or local studios. This in-house origination is modified in frequency, depending upon what channels are available, in the cable system itself. The exception to delayed video or live studio is a local 'time and temperature' channel aired by 36 percent of the cable systems.

Feeding of all the program channels into the transmission line(s) serving the subscribers is done through a 'combining network' that is either feed in series or parallel. This combining network sets

the signal level that is maintained throughout the entire transmission line(s).

PROGRAMS OFFERED

All of the major commerical networks (ABC, CBS, NBC) are offered to Montana cable customers. PBS is offered to 72 percent of the households; HBO to 81 percent; WTBS Alanta to 63 percent; CNN to 27 percent; Showtime to 31 percent; WGN Chicago to 28 percent; CBN to 92 percent (though only 39 percent offering this religious station do so for its entire broadcast day); C-SPAN to 12 percent; USA Network to 24 percent; ESPN to 29 percent. Other programs are offered less than two percent of the total program time.

There is one station in Montana that offers three to six hours weekly of live and tape delayed programing. This multi-variety of sports, public comments and interviews, news and humor is produced and aired by a Montana resident who does so for the enjoyment of the public and without salary. This particular cable station airs this variety show as a public service to its subscribers.

A few systems carry two or more independent stations under 'grandfather' clause or because they serve less than a thousand sub-

scribers. (Both situations are allowed under current FCC regulations.) This total is eight percent of all Montana cable systems. Systems who carry WTBS Alanta but not their sister news program CNN receive several request for this news service, in large part because WTBS actively promotes this program to its viewers.

Complaints and requests for additional programing balance each other: as many people, more or less, that want or object to a particular program are cancelled out by as many opposite requests. Many systems (31 percent) receive few to no requests or complaints. This situation is found only in the smaller, and mid size, systems.

As mentioned in other sections one MSO mails round-robin legislative interview video tapes thorough its stations during the months when the State legislature is in session. These tapes are produced from a portable production studio, for the most part, from Helena.

FUTURE EXPANSION PLANS

All of the systems have just finished a major re-build and added additional program channels or are planning to do so in the next six months to a year. 77 percent of the systems carry, or can carry, twelve channels at present. The remaining 23 percent offer twenty or

more channels. In the next two years nearly 80 percent of all cable systems will offer more than 35 channels. A few systems may opt to carry as many as 55 channels. FCC deregulation will give many systems the green light in this regards (as the number of independent stations satellite down-linked is increasing) as well as use of the 'mid-band' (the frequencies between channels seven and eight).

Future expansion plans include the addition of another parabolic receiving antenna. For the most part Montana cable systems are not planning to add additional square footage or increase staff by more than two people during the next year. (31 percent said they palnned to add one or two people to their staff in the next year.)

MANAGERIAL AND TECHNICAL STRENGTH

Managerial strength has been covered in some detail in the section entitled How a Cable System Works. It is the intention in this section to focus upon the technicians who troubleshoot, add to and maintain the cable systems. Technicains need a good background in electronics to work with any hope of success, in today's cable systems. The least technical skill required is for 'installers'. Installers are the ones who connect, or disconnect, homes to the

transmission line of a system. However, in the smaller systems, the chief technician (who may also be the manager) may also be the one who installs new subscribers. In Montana 22 percent of the technicians gained their experience through 'on the job training'. Nearly half (47 percent) of the technicians were trained in technical schools and 28 percent received electronic training in one of the armed services. 38 percent of the technicians hold either a second or first class FCC license. Six percent hold bachelors degrees in electronics. One MSO offers an electronic home study course to all of its technicians and this same home study is mandatory for all new employees working in the technical areas of the systems, regardless of their background.

The technicians, for the most part, have a good background in cable systems, whether from OJT experience or formal schooling. It is noted that the technicians interviewed were interested and outgoing people. They enjoy their work and the cable television business.

SPECIFIC PROBLEMS

Though 31 percent reported a lack of space this situation was a temporary one do to system re-building. Fifty percent noted a lack of technical personnel. 54 percent were waiting on FCC deregulation to add additional program channels to their systems (independent

stations down-linked from satellites).

Fifty percent of the systems reported delays on shipment of supplies while 12 percent said that supplies were arriving ahead of schedule. One system noted a delay of intra-state shipments from the large population centers to the smaller towns.

Few systems, less than five percent, reported high rates of equipment failure. All noted that the new solid state equipment was superior in operational time to equipment that used vacuum tubes.

GROSS REVENUES

This requirement was requested, "if possible..." in the contract and, due to the competitive nature of an expanding, national cable television market, such a task would have placed this entire study in jeopardy. For this reason, and following several conversations with cable television managers at the beginning of this project, special care has been taken not to identify any single system or individual, or report any information regarding gross revenues.

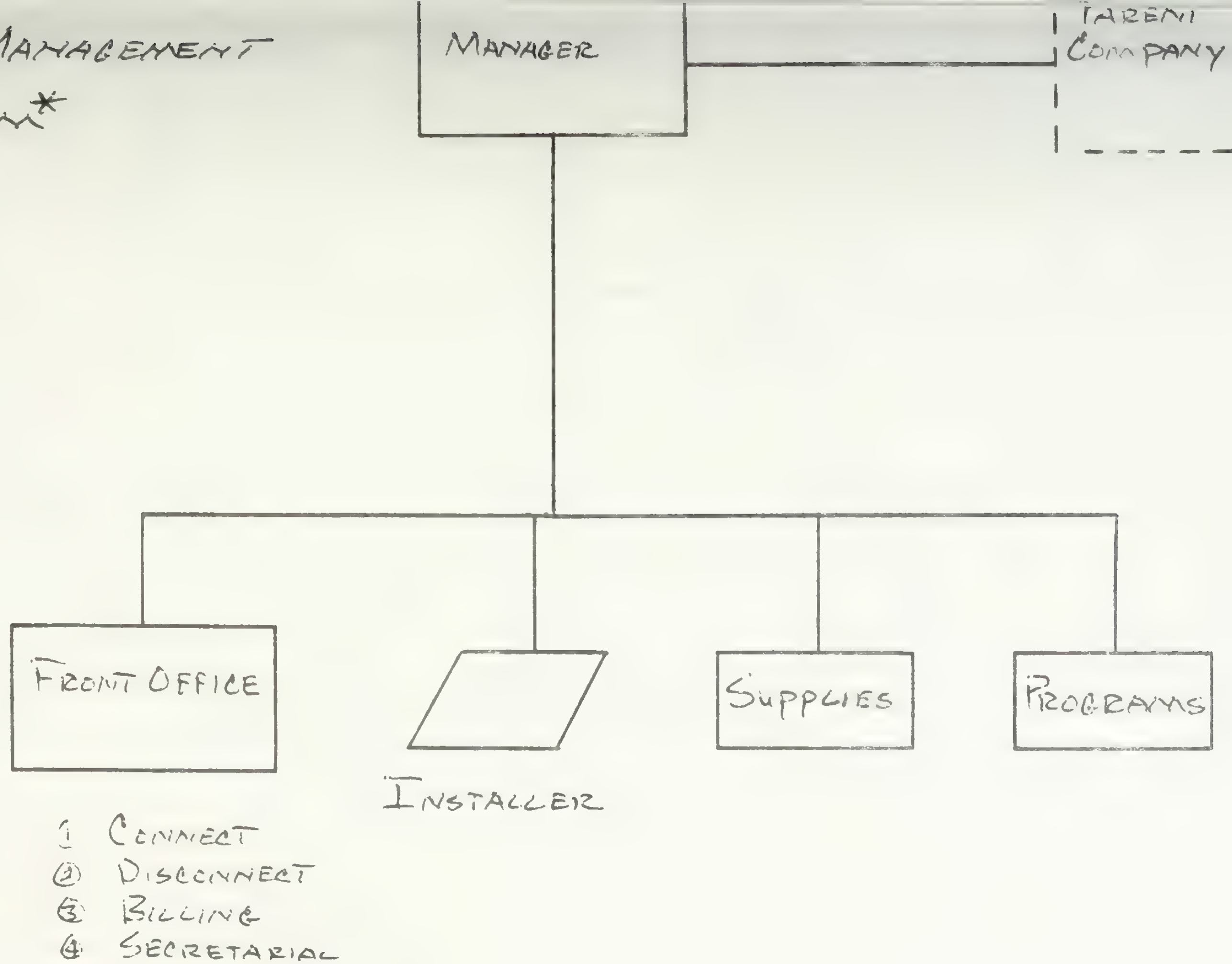
As noted in the executive summary the restriction of not reporting gross revenues does not interfere with the goals of this project; namely the collection of information for the future planning of tele-

communication systems for the general public in Montana.

PRESENTATION TO A TASK FORCE

This project will be presented in full, to such task(s) force(s) as the Office of Telecommunications Project for the State of Montana may wish. The presentation will include several overhead projections in addition to the report and should take about one hour, depending upon questions from task force members.

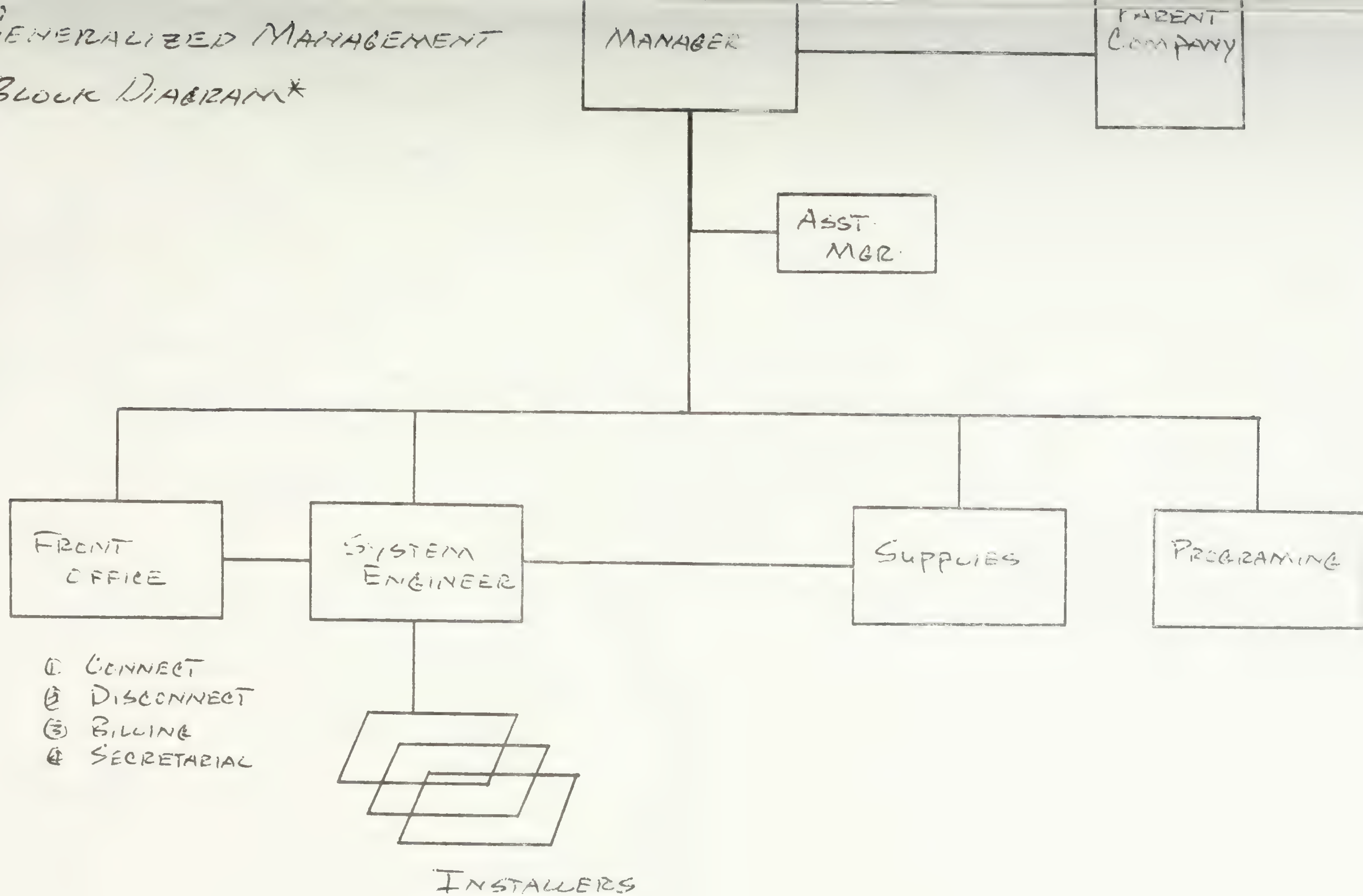
Generalized Management Block Diagram*



*Cable Systems with less than six employees

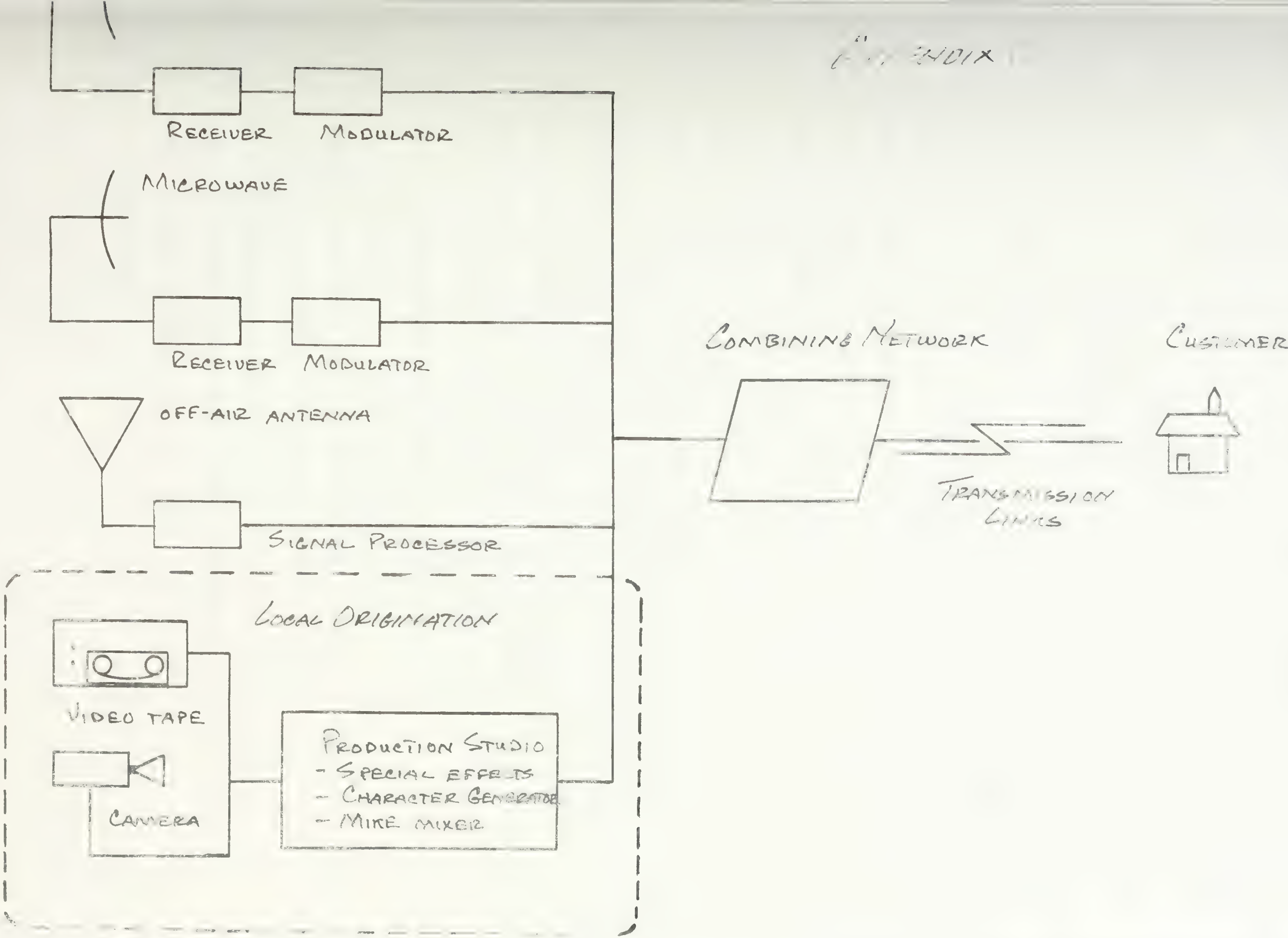
GENERALIZED MANAGEMENT

BLOCK DIAGRAM*



*CABLE SYSTEMS WITH MORE THAN SIX EMPLOYEES

APPENDIX



RECEIVER
MODULATOR
MICROWAVE
RECEIVER
MODULATOR
OFF-AIR ANTENNA
SIGNAL PROCESSOR
LOCAL ORIGINATION
VIDEO TAPE
CAMERA
PRODUCTION STUDIO
- SPECIAL EFFECTS
- CHARACTER GENERATOR
- MIKE MIXER
COMBINING NETWORK
TRANSMISSION LINKS
CUSTOMER

APPENDIX D

LIST OF IMPORTANT TOTALS

	percent (numbers)
Number of production studios (live or delayed video).	6
Number of video tape players	21
Number of character generators	11
Number of systems having time and temperature channels . . .	36
Miles of cable (plant) in place	(2564)
Number of households on present cable systems	(126, 356)
Number of program channels received by satellite	42
Number of program channels received by microwave	35
Number of program channels received off-air	23
Number of systems having a single parabolic antenna	98
Average number of years a manager has in cable systems . . .	(10.40)
Number of technicians with training in a technical school . .	47
Number of technicians with training in military schools . . .	28
Number of technicians trained on the job	22
Number of technicians with 2nd or 1st class license	38
Number of technicians with a bachelors degree	6
Number of systems reporting a lack of technical personnel . .	50
Number of systems having their billing computerized	26
Number of programs originating from local systems (live or tape delayed)	2

cont'

Networks (percentage in all households)

ABC	100
NBC	100
CBS	100
PBS	72
HBO	81
WTBS Atlanta	63
CNN	27
Showtime	31
WGN	[illegible]
CBN (religious)	92
C-SPAN	[illegible]
USA Network	24
ESPN	29
all other	2 or less

Systems that carry, or can carry, twelve channels	77
Systems that offer twenty or more channels	23
Number of systems reporting a temporary lack of space (due to system re-building)	31
Number of stations reporting a delay in shipment of supplies	50
Number of stations reporting shipments ahead of schedule	12
Number of systems reporting a high rate of equipment failure	5

MEMBERSHIP ROSTER

MONTANA CABLE TELEVISION ASSOCIATION

February 2, 1981

ALBERTON
ALBERTON CABLE TV
Alberton, Montana 59820
Victor B. Gates, Owner
722-4955

ANACONDA
ANACONDA CABLE TV
118 Main Street
Anaconda, Montana 59711
Phillip Watt, Mgr.
563-8201

BAKER
BAKER CABLE TV
906 S. 4th West
Baker, Montana 59313
Tom Overton, Mgr.
[illegible]-2937 or 778-2539

BIG FORK
See listing under KALISPELL
for TelePrompter Cable TV

BIG TIMBER
BIG TIMBER CABLE TV
Drawer C
Big Timber, Montana 59011
McLean A. Clark, Owner
932-2976, 932-2441, or 932-2971

BILLINGS
BILLINGS CABLE TV
1124 - 16th St. West
Billings, Montana 59102
Douglas Rice, Mgr.
248-1200

BOZEMAN
BOZEMAN CABLE TV
(also manages Belgrade system)
511 West Mendenhall
Bozeman, Montana 59715
Bob Briney, Mgr.
586-1837

BUTTE
BUTTE CABLE TV
201 East Front Street
Butte, Montana 59701
Douglas Striker, Mgr.
792-5329

CHINOOK
See listing under GREAT FALLS
for Vigilante Satellite Services

CHOTEAU
See listing under GREAT FALLS
for Vigilante Satellite Services

COLUMBIA FALLS
See listing under KALISPELL
for TelePrompter Cable TV

COLUMBUS
CENTRAL CABLE TV
P.O. Box 427
Laurel, Montana 59044
Les Hilliard
628-4290

CONRAD
See Listing under GREAT FALLS
for Vigilante Satellite Services

CROW AGENCY
See listing under HARDIN for
Crow Cable TV

CUT BANK
TELEPROMPTER OF CUT BANK
P.O. Box 836
Cut Bank, Montana 59427
Richard (Don) Cullen, Mgr.
873-2223

DEER LODGE
DEER LODGE CABLE TV
308 Milwaukee Avenue
Deer Lodge, Montana 59722
Lawrence B. Moody, Mgr.
846-1383

(over)

DILLON
DILLON CABLE TV
P.O. Box 1183
Dillon, Montana 59725
Ted Pinkerton, Mgr.
683-2110

EAST HELENA
See listing under HELENA
for Helena Cable TV

ENNIS
MADISON CABLE CO.
P.O. Box 1
Ennis, Montana 59729
Hugh Slowinski, Richard Jones
682-7213

FORSYTH
FORSYTH CABLE TV CO.
P.O. Box B
Forsyth, Montana 59327
Robert L. Schultz, Mgr.
356-7518 or 356-2784

FORT BENTON
See listing under GREAT FALLS
for Vigilante Satellite Services

GLASGOW
GLASGOW CABLEVISION
P.O. Box 407
Glasgow, Montana 59230
Bonnie Hansen, Mgr.
228-2445

GLENDIVE
GLENDIVE CABLE TV
P.O. Box 738
Glendive, Montana 59330
Frank E. Carpenter, Mgr.
365-4151

GREAT FALLS
TELEPROMPTER OF GREAT FALLS
P.O. Drawer 6848
Great Falls, Montana 59406
Walter C. McCall, Mgr.
727-8881

GREAT FALLS (continued)
VIGILANTE SATELLITE SERVICES
(systems in Chinook, Choteau,
Conrad, Fort Benton, Malta an
Townsend)
P.O. Box 2363
Great Falls, Montana 59403
Earl Granger, Mgr.
761-3427

HAMILTON
See listing under MISSOULA
for TelePrompter of Missoula

HARDIN
CROW CABLE TV
P.O. Box 338
Hardin, Montana 59034
Tom Zelka, Owner
665-2103

HARDIN CABLE TV
P.O. Box 362
Hardin, Montana 59034
Jim Luttschwager, Mgr.
665-2859

HARLOWTON
CABLE TV OF HARLO
P.O. Box 582
Harlowton, Montana 59036
Donald L. DeShaw, Owner
632-4300

HAVRE
COMMUNITY TV, INC.
P.O. Box 391
Havre, Montana 59501
Stanley G. Stephens, Owner
265-1120

HELENA
HELENA CABLE TV
(also manages East Helena sys
P.O. Box 5509
Helena, Montana 59601
Wes Huffman, Mgr.
442-6221

KALISPELL
TELEPROMPTER CABLE TV
(also manages systems in Big Fork, Columbia Falls, Polson, Whitefish)
333 First Avenue East
Kalispell, Montana 59901
Ken Young, Mgr.
755-7202

LAUREL
[illegible] CABLE TV
(also manages Rattlesnake system in Missoula)
P.O. Box 427
Laurel, Montana 59044
Les Hilliard, Owner
[illegible]

[illegible]
LEWISTOWN CABLE TV
P.O. Box 638
Lewistown, Montana 59457
Ernie Hruska, Mgr.
538-3818

[illegible]
[illegible] CABLE TV
203 South Main
Livingston, Montana 59047
Randolph Bailey, Mgr.
222-0232

[illegible]LTA
See listing under GREAT FALLS for Vigilante Satellite Services

[illegible]ILES CITY
MICRO-TV, INC.
P.O. Box 489
Miles City, Montana 59301
Tom Glendenning, Mgr.
232-2421

[illegible]ISSOULA
TELEPROMPTER OF MISSOULA
(also manages Hamilton system)
P.O. Box 5327
Missoula, Montana 59806
Larry T. Brodie, Mgr.
728-4205

RATTLESNAKE CABLE CO., INC.
See listing under LAUREL for Laurel Cable TV

PHILIPSBURG
PHILIPSBURG CABLE TV
P.O. Box 40
Philipsburg, Montana 59858
Donald Henke, Owner
563-6600

PLENTYWOOD
PLENTYWOOD CABLE TV
P.O. Box 128
Plentywood, Montana 59254
Ernest Berland, Mgr.
765-1199

POLSON
See listing under KALISPELL for TelePrompter Cable TV

RED LODGE
RED LODGE CABLE TV
P.O. Box N
Red Lodge, Montana 59068
Roger Williams, Owner
446-1880

SHELBY
TELEPROMPTER OF SHELBY
(managed from Cut Bank TelePrompter office)
Box 836
Cut Bank, Montana 59427
Richard (Don) Cullen, Mgr.
873-2223

SIDNEY
SIDNEY CABLEVISION
(also manages Wolf Point system)
208 - 2nd Avenue S.E.
Sidney, Montana 59270
Walter Horton, Mgr.
482-3613

TOWNSEND
See listing under GREAT FALLS for Vigilante Satellite Services

WHITEFISH
See listing under KALISPELL for TelePrompter of Kalispell

WOLF POINT
WOLF POINT CABLE TV
See listing under SIDNEY for Sidney Cablevision

ATTACHMENT E

PART I

EXECUTIVE SUMMARY:

A SURVEY OF MONTANA TELEVISION TECHNOLOGY

The Montana Telecommunications Project is presently assessing all aspects of Montana's telecommunications structure, including television technology. The following report summarizes a survey which studied and assessed the extent of television activity within Montana's Departments of State and surveyed Montana Broadcasters and independent production houses. While the survey inquired into three areas of television activity, the bulk of time and effort was spent describing holdings and needs of Montana's Departments of State. The survey was performed through a survey document, personal interview and telephone survey; while the effort had description as its goal, the information obtained can form a basis for making observations and recommendations to the Telecommunications Project and, particularly, the Television Task Force.

State Holdings

Besides the need to inventory state holdings, the answers to two "unknowns" was sought: 1) how extensively was television technology use? and 2) how well acquainted were agencies with television's potential to serve information and instructional needs?

While holdings, in most circumstances, are not state-of-the art, units within Departments of State use what technology they have. Most have used television long enough to understand how the technology can serve the unique needs of their agencies. In most circumstances, agencies reported a need to upgrade holdings or complete systems; however, the majority of respondents noted that new technology alone would not cause an increased use of television: unless more staff is assigned to units using television, use patterns would remain constant. Based on the expressed need agencies have to upgrade holdings and on those few agencies expressing a desire to expand activity, it is probable that Montana Departments will be purchasing a signifigant amount of hardware over the next few years.

Based on the reported needs and use patterns, the following observations and recommendations might be made:

1) The information derived from the survey does not conclusively argue for a centralized television production system for state agencies. While most agencies can justify simple cameras and recording systems, few can justify exclusive ownership of editing and signal processing systems. Hence, if centralized systems are contemplated, they should be designed with an eye to offering critical but occasional needs which agencies have for services such as editing, other signal processing, duplication, format transfers, etc.

2) Except for the rare television broadcast documentary, virtually all of the reported agency use centered in the industrial-educational area. Based on use, it would be difficult for an agency to argue the need for expensive broadcast quality cameras when less expensive high grade industrial products will supply a signal proportional to the contemplated product: a centralized system might have high quality cameras available for the ocaasional use by all agencies, as it might have high quality editing available.

3) While use patterns do not argue for expensive cameras and recording gear, patterns do indicate that it would be difficult to maintain effort without having a camera and

recording system located at agencies who use television.

4) Agencies reporting use have voiced a preference for either one or another of the video cassette tape machine formats, before either format types are purchased in large quantities, standardization of the machine format should be pursued by agencies contemplating purchases.

5) Based on most agencies willingness to discuss sharing of new acquisitions and pursuing other common efforts, a vehicle of some sort should be put in place to promote communications between users and to promote development of common coherent acquisition plans and production goals.

6) While state personnel who use television appreciate its potential, the survey did not indicate that television was well understood at the higher administration levels of many agencies. Some effort should be made to provide information and orientation to that level of agency activity.

University Holdings

With the exception of Montana's two Universities, television activity is not extensive. With the exception of Eastern Montana College, the instructional television units responsible for delivering product can do so with coherent, if not obsolete, TV production systems.

Because each campus is unique, it is difficult to propose unified activity, though common sense might dictate that units can jointly determine a common instructional television production format that would allow for identical or compatable cameras, editors and duplicating formats.

Broadcasters & Independent Producers

Montana television is small market television. The functional descriptions of the stations listed in the report are descriptions of the standard small market operation.

With two exceptions reported from Great Falls, Montana's independent television production companies are small and marginal efforts. It has been noted, for the last decade, that for-profit production companies seldom find enough work to maintain continuous business activities; it would seem that little has changed in the last ten years. Of the companies surveyed, none has been in business--television--for more than 5 years. The companies surveyed represent a fresh attempt to find a survival

formula for independent television production in Montana: in the last decade 5 companies known to the author have failed after an average three years of activity. If patterns hold true, with the exception of the Gt. Falls companies, the prognosis is not favorable.

The Survey Report concludes a 10 week effort to assess Montana's television technology. It is a modest technology, attempting to maximize effort with a minimum of state-of-the art technology.

ATTACHMENT E

PART II

INTRODUCTION:

AN OVERVIEW OF MONTANA'S TELEVISION PRODUCTION TECHNOLOGY

In 1980, the National Telecommunication Information Agency, NTIA, within the U.S. Department of Commerce, awarded a grant to Montana's Department of Administration, Communications Division, to study Montana's telecommunications needs. The resultant "Montana Telecommunications Project" is presently assessing all aspects of Montana's telecommunications structure, including television technology.

One component of the proposal submitted to the NTIA in Washington was to survey, study and assess the extent of television activity within Montana's Departments of State. Since the funding of the proposal, this study and assessment component has been expanded to include a description of the production activities and capabilies of Montana's television broadcasters and private television production companies: in effect, the mandate was expanded to 'discover' and 'describe' television production activity whereever it could be found, within the categories mentioned.

The period of time alloted to conduct the agency survey and other elements with a final report was seven weeks. Given a compressed time-line, the objectives of the survey for each of the three components differed, as did method; however all of the objectives described below centered on arriving at functional descriptions of those surveyed.

I The objectives of the Department of State survey were:

1) To inventory holdings of equipment which were on-line or on order

2) To describe how the equipment was configured

3) Describe policies in force regarding the sharing or use of the equipment by other agencies.

4) Describe future equipment needs

5) Investigate whether agencies were interested in pooling resources to purchase,in common, television hardware and describe what conditions might attend common hardware use.

For Departments of State with Helena headquarters, a survey document which had been under development was finalized and used to gather the information. Besides the formal document, in-depth interviews were conducted with agencies which evidenced the most extensive use of television or stated their intention to do so. On the theory that film formats provide material for television programing, 16 and 35mm holdings were surveyed.

Units of the University System were surveyed, though not with the same document used for departments. It was assumed that University units would hold equipment which ranges from true 'musuem' pieces to state-of-the-art hardware; interviews with University units focused on acquiring the information necessary to describe on-line equipment and use patterns.

Montana Broadcasters were interviewed with the following purposes in mind:

1) To describe production capability in a functional way, noting special features of each system

2) To describe the special requirements for pre-production, production and post-production which each studio might have

3) Describe locally originated programing

4) List contacts within management in sales, general management, production, etc. for the benefit of prosepective users.

Independent production houses were surveyed in order to describe production capability and to list, with the consent of the principals, noteworthy programs produced by the company.

PART ONE: DEPARTMENTS OF STATE

In Appendix 1-A is the survey document used to gather information from agencies headquartered in Helena. Twenty-three Departments and Offices of State were surveyed of which 10 were found to hold television equipment within 21 subdivisions; an additional six subdivisions or Departments hold only 16 or 35mm photography equipment.

Initial contact was made by phone to determine where video equipment was held, followed by hand delivery of the survey document to state personnel having knowledge of or administering video holdings: on the average, three telephone contacts were made to each Department or Office before an appropriate contact person was found. Within 5 days of the delivery of the document to respondents, telephone followup occured, this, followed by a personal visit to retrieve completed surveys: twenty eight surveys were distributed; 27 were returned. It was left to the contact persons within the agencies to determine where the document would find its home, sometimes a survey would migrate, in the Department of Institutions the survey questions were sent over the Department's teletype to outlying hospitals and homes with answers returned by the same mode, and a xerox of the survey migrated to the Terry Schools and was returned in completed form.

In Appendix 1-B are found the breakouts of each survey question. Answers have been taken out of document sequence and clustered according to:

i major video holdings, cameras, monitors, machines, & significant accessories

ii equipment use

iii future equipment needs

iv inter agency sharing & willingness to acquire future hardware jointly

v 16 & 35mm film activity

Because the survey document was not designed to quantify results, many questions were open to interpretation by those completing the form. At times respondents did not answer certain sections of the survey, which, for tabulation purposes, have been taken to mean "no," "no holdings," or "not applicable"; in few instances were the questions misunderstood.

i <u>Equipment Holdings</u>

Of the 43 television sets reported, few are R.F. channel receivers exclusively; agencies prefer full television monitors: 29 are black & white, 14 color; screen size averages in the high teens; of brands listed, japanese models outnumber domestic brands by 14:1.

Fifty videotape machines are distributed throughout the agencies: One old format BVH 1 inch sony was reported, as were 17 ½ inch reel-to-reel black & white machines; 30 3/4 inch cassette color machines and 2 ½inch color cassette player/recorders were also listed.

One reel-to-reel ½ inch black & white editing system was noted at Training Rehabilitation Information Center at Social Rehabilitation Services. One 3/4 inch editing system was reported by the Renewable Energy Bureau at Conservation and Natural Resources.

Fourty-one television cameras were listed, 13 of which were color--the majority of which were held by Employment Security Division in its Job Service and Training offices. 10 X 1 lenses were scarce with 4-6X1 lenses dominating. It would seem that maintenence of hardware generally occurs after catastrophic failure.

With the exception of Fish, Wildlife & Parks, no sophisticated tripods were reported. Very few agencies have adequate lighting, though most video users have microphones.

ii Equipment Use

Respondents were asked to classify their use of video within five categories:

1. In-house training
2. Documenting speakers
3. Making Public Service Announcements for Television
4. Making television documentaries
5. Preparing television presentations for public meetings

While the question allowed for more than one answer, only one agency reported up to 4 uses for the hardware: 16 respondents use television for in-house training; 11 for documentation; 2 produce Public Service announcements; 3 produce video documentaries for television and 11 use television for presentations at public meetings: 2/3 of the respondents use television for at least two purposes almost half stated three.

Patterns of use seem dependent on a one-to-one correspondence between equipment and original purpose of purchasing the hardware; it is uncertain whether the absence of sophisticated technology is a factor in patterns of use. The survey inquired into frequency of the use of major equipment items; patterns of response would indicate that television is used primarily for playback of prerecorded material: 9 respondents answered that playback was used Daily or weekly; 4 averaged a monthly use with the remainder reporting a non-patterned or infrequent use. In contrast to video machines and monitors use, no agency reported daily camera use: 3 reported weekly; 4 monthly; the remainder reported non-patterned or infrequent use. Less frequent camera use might be dependent on the fact that only one agency reported having full time staff available to the video area: SRS's Training Rehabilitation Information Center. Other agencies have reported that no personnel are assigned or that information officers or other staff are assigned on a very part-time basis.

The most extensive utilization of television is found within the Department of Labor & Industry, Social Rehabilitation Services and in the hospitals administered by the Department of Institutions,

Since the Department of Labor holds the majority of color cameras reported, black & white television production predominates among the respondents. While most respondents reported holding 3/4 inch color cassette video machines, the majority of them are old format with non standard frequency and transport velocity; such timing errors do not cause problems for industrial use, but are problems for television broadcast purposes--newer 3/4 inch machines have corrected these timing errors.

Few agencies reported having set aside permanent viewing or production space; though most have furniture to move the gear within the agency.

From the survey answers it is obvious that the use of television technology by respondents is a simple straightforward use.

iii Needs

In most instances, the equipment needs listed expressed the respondents' desires to upgrade their old formats rather than expand holdings. Three agencies expressed a need for a total of 9 color monitors; six, collectively require 12 color cameras and 6 agencies require the following types of videotape machines:

1	field portable	3/4	inch machine
2	" "	1/2	" cassette machines
7	console	1/2	" " "
8	"	3/4	" " "
1	"	3/4	" editing system

In expressing needs for cameras and monitors, respondents did not list models. The needs expressed for a variety of video machine formats reflect the national confusion: tape machine formats each have advantages and disadvantages based on quality vs cost, portability, engineering and signal standards, etc., etc. Given the recent announcements of high speed 1/2 inch and 1/4 inch cassette formats, the confusion of standards will become worse.

Equipment poor agencies frequently borrow; of 21 respondents, 12 receive periodic requests from other agencies for the loan of their equipment. Of the 10 respondents who lend gear, 3 lend on a monthly average, 3 lend quarterly and 4 report no pattern. Conditions placed on lent equipment are not stringent; most agencies

expect the borrower to take excellent care of the lent items and repair or replace the same if damaged. Several agencies have reported bad experiences with lending and have limited their lending or have required the borrower to use the gear within the agency premises.

The Office of Public Instruction rents its equipment to agencies in the Helena area. With the exception of OPI, no other respondent reported placing a charge on lent gear.

iv Sharing Future Purchases

Two survey questions dealt with sharing future video purchases:

1. For future purchases would you be willing to acquire hardware jointly with another agency and share the item?
2. What special conditions would you set for joint purchase of the item?

To the first question, 5 respondents gave no answer, 2 replied "not applicable", 1 stated it wasn't permitted due to grant regulations, 5 answered no, and respondents in the following agencies said yes:

	n
Department of Justice	2
Social Rehabilitation Service	1
Natural Resource & Conservation	2
Institutions	2
Health & Environmental Sciences	1
	8 yes

Those respondents willing to consider joint purchase listed few special conditions:

a) The Highway patrol listed conditions as "unknown"
b) The Law Enforcement Academy would require that equipment be available to law enforcement units
c) SRS's Training Rehabilitation Information Center had not set conditions at this time
d) The Renewable Energy Bureau at DNRC would require compatable and complimentary hardware to fit their 3/4 inch editing system
e) DNRC's Land Use Planning Division has not decided
f) Institution's Eastmont Training Center in Glendive has left the matter to be worked out
g) Corrections would require 50% use time
h) Health & Enviromental Science's Solid Waste Management Bureau listed "none"

One should not conclude from the respondent's listing of such few conditions that joint purchase would be realized easily; video users have specific purposes in wanting hardware and have specific formats in mind, not to mention the potential for complications arising at any level within a department's management component. While joint purchase agreements would take time to formulate, the discovered pattern of generous lending, by most units holding video, argues, that if joint purchase and use policies are pursued in the same spirit as lending policies, this option might prove a cost effective way to upgrade hardware.

v 35 & 16mm Film

With few exceptions, all respondents own and use the 35mm format. 35mm use repeats the types and priority of use reported for television: 15 respondents use 35mm for staff training; 13 use slides for public meetings and 4 use 35mm for Public Service Announcements. Compared to one respondent's having staff for video production, 10 report staff assigned to produce 35mm materials. Few respondents report contracting out 35mm work: 4 report infrequent contracting.

Two agencies reported 16mm holdings. The Commissioner's Office of the Department of Lands has 16mm which is infrequently used; Fish & Game has extensive holdings in 16mm and has staff support assigned to produce Public Service Announcements, at least one documentary for television per year, to document field work and to use film for public instruction. Fish & Game is the only respondent to report film editing capacity, sound sync recording & playback, sound mixing and synchronos film-sound playback. Fish & Game's accessories are of fine professional quality.

IN DEPTH FOLLOWUP

SURVEY CONTACTS-STATE AGENCIES

STATE BOARD OF EDUCATION	
Museum Project	Patty Dean 449-2694
FISH AND GAME	
Film Center	Mike Gurnett 449-2733
HEALTH AND ENV. SCIENCES	
Film Library	Robert Solomon 449-3444
Solid Waste Mngt. Bureau	Charles Woods 449-2406
DEPT. OF HIGHWAYS	
Personnel Division	LeRoy Broughton 449-2073
Preconstruction	Dave Morgan 449-2495
DEPARTMENT OF INSTITUTIONS	
Alcohol & Drug Abuse Div.	Stancliff 449-2872
Warm Springs	Keith RosenLean ext 2295
Boulder River School	Stuff Derel ext 330
Eastmont Training Center-Glendive	Cindy 365-6001
Galen	Dan 693-2811
Corrections	James Burgeos
DEPT. OF JUSTICE	
Highway Patrol	Matt Miller 449-3000
Law Enforcement Academy	Bob Kuchenbrod 449-3800
LABOR AND INDUSTRY	
Employment Security Div.	Russ Perry 449-2638
Worker's Compensation Div.	Carla Smith or Andrew Kiely 449-3182
Centralized Services for Employment Training and Compliance	Bill Salisbury 449-5600
NATURAL RESOURCES AND CONSERVATION	
Renewable Energy Bureau	Tom Livers 449-4624
Land Use Planning Div.	Mary Hatley 449-4600
SOCIAL AND REHABILITATION SERVICES	
T.R.I.C.	Ted Spas 449-5647

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OFFICE OF PUBLIC INSTRUCTION	
Library Media Component	Gladys Bloom 449-3120
ADMINISTRATION	
Communications Div.	Ted Whitling 449-2586
DEPT. OF AGRICULTURE Directors Office	Mary Evans 449-3144
OFFICE OF THE GOVERNOR	Dave Wanzenreid 449-3111
DEPT. OF LANDS	
Commissioner's Office	Leanna Gober 449-2074
DEPT. OF HIGHWAYS	
Photo Unit	Travis Smith 449-2432
Travel Promotions	Gary Wunderwald 449-2654
DEPT. OF JUSTICE	
Fire Marshal	S. Clause 449-2050
Criminal Investigation Bureau	no contact 449-2769
Board of Crime Control	C. Bain 449-3604

ATTACHMENT E

PART III

A SURVEY OF MONTANA TELEVISION TECHNOLOGY

Prepared For:

MONTANA TELECOMMUNICATIONS PROJECT

Department of Administration
Helena, Montana

June, 1981

By:

Montana Institute for High Technology Applications
Missoula, Montana

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INTRODUCTION:

AN OVERVIEW OF MONTANA'S TELEVISION PRODUCTION TECHNOLOGY

In 1980, the National Telecommunication Information Agency, NTIA, within the U.S. Department of Commerce, awarded a grant to Montana's Department of Administration, Communications Division, to study Montana's telecommunications needs. The resultant "Montana Telecommunications Project" is presently assessing all aspects of Montana's telecommunications structure, including television technology.

One component of the proposal submitted to the NTIA in Washington was to survey, study and assess the extent of television activity within Montana's Departments of State. Since the funding of the proposal, this study and assessment component has been expanded to include a description of the production activities and capabilies of Montana's television broadcasters and private television production companies: in effect, the mandate was expanded to 'discover' and 'describe' television production activity whereever it could be found, within the categories mentioned.

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The objectives of the Department of State survey were:

1) To inventory holdings of equipment which was on-line or on order.

2) To describe how the equipment was configured

3) Describe policies in force regarding the sharing or use of the equipment by other agencies.

4) Describe future equipment needs

5) Investigate whether agencies were interested in pooling resources to purchase, in common, television hardware and describe what conditions might attend common hardware use.

For Departments of State with Helena headquarters, a survey document which had been under development was finalized and used to gather the information. Besides the formal document, in-depth interviews were conducted with agencies which evidenced the most extensive use of television or stated their intention to do so. On the theory that film formats provide material for television programing, 16 and 35 mm holdings were surveyed.

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Montana broadcasters were interviewed with the following purposes in mind:

1) To describe production capability in a functional way, noting special features of each system.

2) To describe the special requirement for pre-production, production and post-production which each studio might have.

3) List contacts within management for the benefit of prospective users.

Independent production houses were surveyed in order to describe production capability and any other special features they might have: a representative sample was sought.

PART ONE: DEPARTMENTS OF STATE

In Appendix 1-A is the survey document used to gather information from agencies headquartered in Helena. Twenty-three Departments and Offices of State were surveyed of which 10 were found to hold television equipment within 21 subdivisions; an additional six subdivisions or Departments hold only 16 or 35 mm photography equipment.

Initial contact was made by phone to determine where video equipment was held, followed by hand delivery of the survey document to state personnel having knowledge of or administering video holdings: on the average, three telephone contacts were made to each Department or Office before an appropriate contact person was found. Within 5 days of the delivery of the document to the respondents, telephone followup occured, this, followed by a personal visit to retrieve completed surveys: twenty eight surveys were distributed; 27 were returned. It was left to the contact person within the agencies to determine where the doucment would find its home, sometimes a survey migrated: in the Department of Institutions, the survey questions were sent over the Department's teletype to outlying hospitals and homes, with answers returned by the same mode; a zerox of the survey migrated to the Terry School system and was returned completed.

In Appendix 1-B are found the breakouts of each survey questions. Answers have been taken out of document sequence and clustered for reporting purposes in the following manner:

i major video holdings: cameras, monitors, machines and significant accessories.

ii equipment use

iii future equipment needs

iv inter agency sharing & willingness to acquire future hardware jointly

v 16 & 35mm film activity

Because the survey document was not designed to quantify results, many questions were open to interpretation by those completing the form. At times respondents did not answer certain sections of the survey, which, for tabulation purposes, have been taken to mean "no," "no holdings," or "not applicable": in few instances were the questions misunderstood.

i Equipment Holdings

Of the 48 television sets reported, few are R.F. channel receivers exclusively; agencies prefer full television monitors: 34 are black & white, 14 color; screen size averages in the high teens; of brands listed, japanese models outnumber domestic brands by 14:1.

Fifty videotape machines are distributed throughout the agencies: One old format BVH 1 inch sony was reported, as were 17 ½ inch reel-to-reel black & white machines; 30 3/4 inch cassette color machines and 2 ½inch color cassette player/recorders were also listed.

One reel-to-reel ½ inch black & white editing system was noted at Training Rehabilitation Information Center at Social Rehabilitation Services. One 3/4 inch editing system was reported by the Renewable Energy Bureau at Conservation and Natural Resources.

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With the exception of Fish, Wildlife & Parks, no sophisticated tripods were reported. Very few agencies have adequate lighting, though most video users have microphones.

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Respondents were asked to classify their use of video within five categories:

1. In-house training
2. Documenting speakers
3. Making Public Service Announcements for Television
4. Making television documentaries
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While the question allowed for more than one answer, only one agency reported up to 4 uses for the hardware: 16 respondents use television for in-house training; 11 for documentation; 2 produce Public Service announcements; 3 produce video documentaries for television and 11 use television for presentations at public meetings: 2/3 of the respondents use television for at least two purposes almost half stated three.

Patterns of use seem dependent on a one-to-one correspondence between equipment and original purpose of purchasing the hardware; it is uncertain whether the absence of sophisticated technology is a factor in patterns of use. The survey inquired into frequency of the use of major equipment items; patterns of response would indicate that television is used primarily for playback of pre-recorded material: 9 respondents answered that playback was used Daily or weekly; 4 averaged a monthly use with the remainder reporting a non-patterned or infrequent use. In contrast to video machines and monitor use, no agency reported daily camera use: 3 reported weekly; 4 monthly; the remainder reported non-patterned or infrequent use. Less frequent camera use might be dependent on the fact that only one agency reported having full time staff available to the video area: SRS's Training Rehabilitation Information Center. Other agencies have reported that no personnel are assigned or that information officers or other staff are assigned on a very part-time basis.

The most extensive utilization of television is found within the Department of Labor & Industry, Social Rehabilitation Services and in the hospitals administered by the Department of Institutions,

The color cameras reported are not distributed evenly--the majority are held by Labor & Industry, hence black and white television production predominates among respondents. While most respondents report holding 3/4 inch color cassette video machines, the majority of these are old format, having non-standard color frequency signals and velocity problems: such timing errors do not cause problems for industrial use, but are problems when a recorded signal has to be time base corrected for broadcast. The newer 3/4 inch machines held by agencies do not have these problems.

Few agencies reported having set aside permanent viewing or production space; though most have furniture to move the gear within the agency.

From survey answers, it is obvious that the use of television technology by respondents is a simple straightforward use.

iii Needs

In most instances, the equipment needs listed expressed the respondents' desire to upgrade their old formats rather than expand holdings. Three agencies expressed a need for a total of 9 color monitors; six require a total of 12 color cameras and six agencies require the following types of videotape machines.

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Two survey questions dealt with sharing future video purchases:

1. For future purchases would you be willing to acquire hardware jointly with another agency and share the item?
2. What special conditions would you set for joint purchase of the item?

To the first question, 5 respondents gave no answer, 2 replied "not applicable", 1 stated it wasn't permitted due to grant regulations, 5 answered no, and respondents in the following agencies said yes:

	n
Department of Justice	2
Social Rehabilitation Service	1
Natural Resource & Conservation	2
Institutions	2
Health & Environmental Sciences	1
	8 yes

Those respondents willing to consider joint purchase listed few special conditions:

a) The Highway patrol listed conditions as "unknown"
b) The Law Enforcement Academy would require that equipment be available to law enforcement units
c) SRS's Training Rehabilitation Information Center had not set conditions at this time
d) The Renewable Energy Bureau at DNRC would require compatable and complimentary hardware to fit their 3/4 inch editing system
e) DNRC's Land Use Planning Division has not decided
f) Institution's Eastmont Training Center in Glendive has left the matter to be worked out
g) Corrections would require 50% use time
h) Health & Enviromental Science's Solid Waste Management Bureau listed "none"

That agreement with agencies, regarding sharing, would be an easy matter does not follow from respondents' listing such few conditions regarding sharing: video users have specific purposes in mind regarding equipment and formats, also, the potential for complications arising at levels within a Department's management component always exists. If joint purchase agreements could be pursued in the same spirit of cooperation which lending policies exhibit, then, joint purchase and pooling might be a cost effective alternative for Departments.

v <u>35 & 16mm Film</u>

With few exceptions, all respondents own and use the 35mm format. 35mm use repeats the types and priority of use reported for television: 15 respondents use 35mm for staff training; 13 use slides for public meetings and 4 use 35mm for Public Service Announcements. Compared to one respondent's having staff for video production, 10 report staff assigned to produce 35mm materials. Few respondents report contracting out 35mm work: 4 report infrequent contracting.

Two agencies reported 16mm holdings. The Commissioner's Office of the Department of Lands has 16mm which is infrequently used; Fish and Game has extensive holdings in 16mm and has staff assigned to produce: Public Service Announcements, at least one documentary for televising per year, documentation of field work, and production of public education materials. Fish & Game is the only respondent to report film editing capacity, sound sync recording and playback, sound mixing and synchronos film-sound playback. Fish & Game's accessories are of fine professional quality.

IN DEPTH FOLLOWUP

Returned surveys allowed for select in-depth interviews with agency respondents reporting a more-than-occasional use of video, or, the desire to do so. Time constraints did not allow every respondent in this classification to be intervied in person;

in Appendix 1-C are the names of respondents and agencies interviewed, accompanied by short descriptions of their television activities: six in all.

Interviews with respondents were informal and addressed the following areas:

1) it was assumed that, in most circumstances, agency holdings would not be state-of-the-art; the interviewer inquired whether state-of-the-art-technology would make a difference by increasing the utilization of television by the agency.

2) Industrial television offers cost benefits by reducing travel time and expense; also it will allow a more effecient use of key training personnel. The interviews sought to determine the respondent's attitudes toward this factor.

3) Television production depends upon a variety of skills seldom found in the same person; given few reported FTE's assigned by agencies to this area, personnel needs were discussed.

4) Invariably, the interviews revealed the priority which television has been given by respective Departmental Administrations.

5) Agencies interviewed were those expressing a willingness to discuss sharing the costs of new hardware acquisitions. More details were sought.

State of the Art Technology

In most circumstances, the availability of state-of-the-art technology would make a difference to those interviewed. Qualified exceptions to this inquiry were made by Fish & Game and Health & Environmental Sciences. In the case of Fish & Game, it was noted that the capital investment in film and its superior portability in many field situations would keep 16 mm alive and well. However, video was recognized as a time saving device for Public Service Announcements and various education programs. The film center at Health & Environmental Sciences is, primarily, a distribution & duplication operation. Present holdings could stand refinement, however, within operational constraints, new gear would not substantially effect operations.

For the Department of Institutions, state-of-the-art technology would mean the opportunity to standardize formats and allow for more effecient use of software; new technology probably would not increase in-house production.

For respondents in Justice, DNRC and SRS, new technology would not only upgrade present capacity, but also allow for an expansion or refinement of present efforts.

The latter three respondents have components of already planned coherent systems. SRS's Training Rehabilitation & Information Center and DNRC favor systems using 3/4 inch formats while Justice Dept. specifies Beta format. The differences which system completion or upgrading would have on operations are the following.

TRIC

Of all respondents surveyed, TRIC has the most long term experience in using a coherent television production mix: portable, plus portable studio, plus editing. TRIC's distribution efforts are the most extensive also. Upgrading to color with editing would result in the following advantages:

a new color portability would enhance and increase production opportunities which could be acted on.

b control track editing would result in a substantial decrease in editing time.

c the new format would allow TRIC to better organize its duplication and distribution efforts.

d overall time saved with new technology would allow for more programs produced with the same number of personnel within the same time frames.

DNRC

The completion of DNRC's holdings would allow it to produce Public Service Announcements, essays on DNRC projects which could be shown at fairs and public meetings, critical information regarding environmental impact statements, speaker documentation and an occasional television documentary.

DNRC's experience in television seems to be occasioning the development of an approach or policy toward television production with the following observed emphases:

a because much of the information about DNRC's programs is technical, there is a disposition to develop an in-house ability to script television productions.

b a finished television production is not viewed as a single purpose product; television production, whenever possible would be planned for multiple purpose.

c except for the rare TV documentary, video production is being viewed as a vehicle for educating many small special interest audiences.

d while television production will find a place within the Department's information giving process, publications and other communications formats will still share priorities.

d the Department is aware that its use of television technology will not be so intensive that access to its present holdings by other agencies would be foreclosed.

The predictable availability of a portable system would allow the agency to develop in-house capability without extensive recourse to expensive private production companies.

Highway Patrol

Personnel within the Highway patrol are well aware of the difference new television technology would make if their contemplated system comes into being. The Patrol views developing video software and bicycling materials to their regional training centers as a superior way to take advantage of expertise located in or passing through Helena. The Highway Patrol sees video as a way to insure that the same information reaches personnel or trainees at the same time.

Television's Cost Benefits

The respondents surveyed were aware that television offers cost savings. The importance which respondents placed on savings depended upon what each was doing with its unique programs.

The Highway Patrol & TRIC maintain extensive field training efforts; quite naturally, travel, personnel time and distribution of training materials are costs which they recognize television can help control. Other respondents do not maintain extensive training efforts and have client groups which do not require a continuous flow of information; with such a client profile, television is seen as an effecient tool for storing and retrieving information for public meetings, workshops, etc.

Personnel for Television Production

Lack of personnel hampers television use more than lack of technology. All the respondents voiced the awareness that

television production requires a variety of skills which personnel hired for non television tasks seldom have to any degree. With the exception of TRIC, other agencies rely on winging it with personnel who learn as they shoot or have been fortunate to have personnel on staff who have related experiences in 16mm or 35mm to get the job done: for example, Highway Patrol is fortunate to have Bob Fears who has experience in television medical education before coming to Justice, as DNRC is fortunate to have information officers experienced in photography and some television. Given tighter budgets, the respondents were not optimistic that personnel problems will be solved.

In its image processing mode, television technology can be located in relatively small spaces; in an indirect way, respondents were asked what their attitudes might be to colocating staffs doing television in one building: the inquiry did not ellicit much of a response.

Television's Priorty Rating Within Agencies

Conversations revealed that when budget cuts have to be made in the annual budgeting process television hardware is one of the first victims. The priority rating given television was universally reported as "low".

Sharing Hardware Acquisition Costs

While the principle of sharing was commonly agreed upon, needs particular to each agency qualified that agreement.

For Fish & Game, field work occurs on a planned and an 'opportunity' basis; it would be difficult to share a field portable system when personnel would require short notice access. Highway Patrol is planning a fairly extensive in-house studio type production effort; many of its programs will be of the 'opportunity' type which would require short notice. TRIC produces on a regular basis with productions planned; TRIC's operational configuration might allow a predictable hardware scheduling from a shared pool; this would hold true for the other respondents whose planned productions are not that extensive.

Scheduling editing is not as critical a 'demand' problem to respondents. It was suggested to respondents that unless an agency could predict 1000 hours of editing time use per year, there was little justification for purchasing an editing system: no respondent reported a 1000 hour per annum need.

HOLDINGS AT MONTANA'S SIX-UNIVERISTY UNITS

The following University System personnel were interviewed either by phone or on site visits:

Montana State University*
Television Center
Jack Hyyppa, Director
Tom Jenking, Engineer
Bozeman, 994-3437

Western Montana College*
Instructional Media
Sally Mortier, Director
Dillon, 683-7011

Montana College of Mineral Sc.*
Media, Publications & Information
Dave Edelman, Director
Butte, 496-4193

Eastern Montana College*
Instructional Development Cntr.
R. S. Jassal, Director
Dennis Sculd, Production Director
Billings, 657-2171

University of Montana
Radio Television Dept.
Gregg McDonald, Television Dir.
Charles Lubrect, Engineer
Missoula, 243-4931

University of Montana
Instructional Materials Services
Robert Wachtel, Production Director
Missoula, 243-4070

Northern Montana College
Instructional Media
Cris Middleman, Director
Havre, 265-7821

On Line Systems:

For reporting purposes, equipment holdings within the University system have been classified as coherent or incoherent production systems. Coherency has been defined as the ability to tape, edit, and duplicate video programs on the same format machines in either B & W or in color. Acquisition patterns are termed coherent if they evidence attention to such factors as compatability of formats, potential for aggregating to more sophisticated systems

* On site visits made

or staggered use, awareness of state-of-the-art and obselesence patterns in industry effecting compatability of the formats with standard accessories or auxiliary production tools--character generators, patching systems, distribution, etc.

With the exception of Western Montana College, all units of the University System can produce videotape coherently in Black & White. B & W holdings are old, but still used for video-taping lectures, group therapy, etc. As mentioned in describing the uses to which Dept. of Instutions puts television, respondents report that there is a place for B & W television where color would not add appreciably to the product.

Coherent color production occurs at three units: the two Universities and Northern Montana College. The three units reporting color coherency all produce and edit in 3/4 inch format; MSU's TV Center also produces coherently in 1 inch Ampex C format. Eastern Montana College and Montana Tech have color production capability on various formats, while Western has a modest record & playback B & W capability.

Only the two University units reported sophisticated hardware; both units now have studio and field-portable 3 tube cameras with 10x1 lenses, control track editing--SMPTE time code for the U of M--and time base correction with title generation, multiplexers, etc. After many years of operating museums, both Universities can now claim full broadcast configuration state-of-the-art systems.

Coherence of acquisition patterns are evidenced at the two Universities, Northern, Western and Montana Tech. While Western Montana College has a simple system it was purchased with coherence in mind. Northern's system is 3/4 inch mainline, with some B & W occasionaly used; Northern will continue in the 3/4 inch format with expectations of upgrading with newer versions of present holdings. Montana Tech has delayed purchase of new systems until declining costs of quality television hardware allowed the purchase of a integrated system: for Montana Tech that crossover point seems to have been reached and discussions are underway concerning system upgrade. Western, at Dillon, has been the stepchild of the University System for several bienniums, with a renewed mandate, plans to install an integrated television system are being discussed.

Patterns of Use

Traditionally, within higher education, television has been assigned a dual mandate: 1) to serve as a tool to instruct students in the use of television technology and 2) to act as an instructional tool for academic departments. While doing both, television in tax supported institutions is also expected to be available for public service in one form or another. Units within the University System have addressed these issues in individual ways.

1) The University of Montana divides television effort into the academic department of Radio Television and a production component in Instructional Materials Service. Territories have been well enough established at the University that both elements perform their roles harmoniously. Both units have their primary purpose as support of academic functions, both units have supported grant projects which are considered extra-academic and have made services and hardware available for non academic public service projects.

2) The Television Center at Montana State Univeristy is the major service deliverer for television at the unit: some hardware is located in Secondary Education, but is primarily of a record/playback nature without coherence. Recently the TV Center was defined as an independent support element within the University with a mandate to serve the academic needs of the Radio Television Program and the Instructional needs of the departments.

3) Northern Montana College at Havre is primarily a service deliverer within the audio-visual support component. Considerable television use is reported for documentation, use by Education, English, P.E. and Art Departments. Personnel is not always adequate for needs; over time some instructors have learned to be their own producers. More use would be possible if funds were available to allow faculty release time to develop educational software.

4) Montana Tech is presently developing an integrated approach to use television as an interactive tool for instruction. A studio class room is being planned for a two camera production capability. As a technical school, television is viewed as a means of giving perspective and enrichment to course material which is highly abstract.

5) Patterns of use at Western are determined by the lack of a sophisticated format. An adequate studio space is available for documenting lectures and other information; the equipment is portable and moves from building to building. The A-V component does not have a 3/4 inch color machine, when needed, it borrows a machine from the local hospital.

6) Eastern Montana College is the only unit surveyed which evidences an extreme balkanization of holdings: non coherence in instructional effort and in equipment acquisition. While the designated instructional support component at Eastern, the Instructional Development Center, has a coherent B&W production capability--with 3/4 and 1/2 inch record/playback and while it supports the instructional efforts of departments which have no video holdings, it is only one of a number of the incoherent delivery systems on campus: in the last few years, departments have been acquiring their own holdings which represent better technology than that held by the Center.

The complex housing the A-V component has the best lecture hall observed: two 35mm back screens behind the podium, mic and slide switching from the podium with excellent acoustics. To date, the Development Center has not had resources to adapt the hall for video. The Center recently suffered from a space reduction which has eliminated its studio production area; having won approval for a large screen projection system, it has no place to house it.

While the Instructional Development Center evidences the ability to deliver coherent services, balkanized holdings and departmental independence make the television effort at Eastern the most incoherent, most duplicative and most wasteful observed, whether it be within the University System or Departments of State.

Non Academic & Public Service Use

All units of the University System respond to community requests and on-campus requests which do not strictly fall within supporting a degree program or other instruction. With the exception of the two Universities, requests at other units are too infrequent to report a pattern.

Television holdings at both universities developed from the degree giving programs each offer in Broadcast; from that original foundation, both have developed similar approaches to offering services, but with a different emphasis.

The TV Center at Bozeman now functions as an independent production unit; it is subsidized for its support given to the Film/TV degree program, and other clearly agreed upon services, but must cover any shortfalls from services given non specified campus and off-campus users. As such, the unit has a modified mandate to achieve self-sufficiency.

Since defined subsidies are not sufficient to cover all expenses, the TV Center actively seeks projects and is in the process of developing services for state agencies and public service organizations: for example, the Center offers state agencies a quality Public Service Announcement at $150.00 per PSA. The Center has a published rate card used for non academic & grant projects. Like the University of Montana, the TV Center will not engage in productions which compete with private houses. At a casual glance, the rate card might appear too rigid; however, the Center does negotiate, and is sensitive to its obligations as a tax supported entity to provide services to the tax paying community.

There is no way to escape the fact that television production costs money; however, a potential user of a facility like the TV center should keep the following in mind.

1. The more planning, before production, which the client can do in-house will save money and allow the producer to concentrate on television: have a well developed script or production idea, have a clear idea of desired special effects, etc.
2. Panic television production results in panic prices; if a walk-in expects to command a facility on short notice, then expect to pay accordingly for the inconveniences caused the producer. A thirty day notice for the Bozeman facility is appreciated.
3. For projects which involve grant funds 'to be requested', it is wise to involve a production facility before grant submission, rather than requesting a specific sum in expectations that the awarded line item will be sufficient to achieve the expected result.

Support for instructional efforts is concentrated at the Instructional Materials Services at the University of Montana; the Radio/Television Department supports an academic effort. The most coherent television holdings at the University are located in the Radio/TV department.

Where the University IMS is not able to provide instructional support to a department, Radio/TV assists; television production under grants is generally done by Radio/TV. While the department is subsidized for its academic efforts, a larger percentage of its television revenues derive from non-academic production: grants, etc. Because Radio/TV's mandate is academic, and the bulk of its time is spent on teaching, it differs from Bozeman's TV Center. Radio/TV has no published rate card; when time allows, it is more than willing to discuss giving support to a project on a case by case basis with charges dependent on time available and the ability of the prosepective user to pay. The Department does not compete directly with for-profit production houses; when faced with a project that could be done by a for-profit, it will deliver the service only if it can be done nowhere else.

Like the TV Center in Bozeman, prospective users should note the three observations already made concerning costs and effeciencies if using the Missoula facility. It should be mentioned, that when both facilities release hardware for projects, operators must accompany the equipment: neither facility can be described as a "hands-on" facility.

PART TWO: BROADCAST FACILITIES

All Montana Broadcasters were surveyed either by phone or personal visit: station facilities already known to the investigator were surveyed by phone, unknowns visited. Six of the eleven television stations are owned by two networks: Montana Television Network--KXLF; KTVQ; KRTV; & KPAX; Eagle Communications, KECI; KCFW--the remaining stations are either locally owned or are the only stations representing a corporation's activity in Montana.

Montana Stations & Persons Contacted

Billings:

KTVQ
3203 3rd. Ave. N.
J. R. Middleton: Chief ENG.
252-5611

KULR
Indian Caves Road
Bob Korum: Manager
252-4676

Butte:

KXLF
1003 S. Montana
Bill Leech: Production Dir.
496-4193

Great Falls:

KFBB
N. of Gt. Falls
Ted Schroeder: Production Dir.
453-4377

KRTV
N. of Gt. Falls
Scott Travis: Production Dir
453-2433

Kalispell:

KCFW
401 1st. Ave. E.
Mike Stocklin: Vice President
755-5239

Hardin:

KOUS
Drawer D
Tom Curtis: Manager
655-3320

Helena:

KTCM
(survey completed by mail)
2433 N. Montana
443-5050

Miles City:

KYUS
David G. Rivenes: Manager
232-3540

Missoula:

KPAX
2204 Regent
Pete Frieden: Manager
543-7106

KECI
340 W. Main
Jack Scholmer: Program Dir.
721-2063

All Montana broadcast stations serve what national rating services call 'small markets': the largest, Billings, is rated by Nielson as 174th among 214. Though Montana's stations serve small markets, FCC rules and Network affiliation standards require that signal quality and service to the local population are of the same level as major markets.

The survey of stations yielded few suprises; every station surveyed can field 2 cameras for studio production; the main line camera technology is state of the art; main line video tape machines show some differences which reflect an individual station's production philosophy.

Three stations rely exclusively on 3/4 inch video machines: KOUS, KYUS & KCFW.--the remaining Montana stations rely on 1 inch or 2 inch technology. Within the Montana Television Network, there is movement toward installing the new 1 inch helical scan technology.

Regardless of main line video machines, all stations can now play back 3/4 inch tapes and time base the same for broadcast purposes.

With few exceptions, broadcasters have installed 3/4 inch editing suites for their news gathering efforts. within the Montana Television Network, film still plays a significant role.

Montana television stations did not report that they considered themselves as production houses: stations seldom act as contracted producers. As small market stations, Montana's broadcasters report that their local public affairs programs and production for advertisers effectively ties up most of their production capacity. Montana stations report that they will produce special programs if the same have some utility for their service area; where such is not the case they would prefer that a potential program be produced by a independent production house.

Montana broadcast, historicaly, began on shoe string financing; perhaps that era is coming to a close. While small, Montana's Broadcaster have on line coherent state of the art technology, in cameras, switching and tape machines.

PART THREE: INDEPENDENT PRODUCERS

Eight independent production facilities were sampled to assess the overall state of independent production art. Three of those interviewed began as film production houses, the remaining began with television technology.

Independent's Surveyed

Bozeman:

Western Am. Film Co. Box 217 Ken Slater 587-2520	Ron Bayley Film & Tapes 202 S. Lindly Pl. Nancy Bayly Landgres 586-9656

Great Falls:

Rico Lion 1001 3rd. Ave. NW Jim Colla	North Country Media Group Box 2244 Voanne Attwood & D. Bliler

Helena:

Video Express 5530 Georgia Dr. Gary Tyree 458-9864	WarWood Productions 1028 Helena Dennin Woodhouse 442-6580

Missoula:

MQ/TV 210 N. Higgins Mary Canty 543-6333	Mont. Inst. High. Tech. Appl 210 N. Higgins M. Wisocki 721-1156

Though the surveyed organizations represent a profile of independent production, by no means, is the list inclusive.

In general production houses hold inexpensive 3 tube cameras: KY 2000's and Sharp XL 700's or Sony single tube 1640's, 1610's or Hitach GP series. All respondents produce in 3/4 inch format, though editing is performed either on 3/4 inch, 1 inch or Quad.

Three organizations report holding 3/4 inch editing systems: Rico Lion; Western Am. Film Company; Montana Inst. One independent, North Country reports 1 inch C format editing and high end 3 tube Hitachi SK series camera.

Independents support their efforts in a variety of ways: the three film companies who transferred their activities to video are using television technology to service clients who originally used film--the Bozeman film operations produce documentaries, commercial ads, and produce instructional training films. Rico Lion, in Gt. Falls, is the only respondent to report

a major self-financed effort to produce its own properties for distribution to the educational/industrial market. The remaining companies report relying on contracts to make expenses. Of the respondents surveyed, the former film companies are the longest lived and report a larger percentage of revenue is derived from out of state contracts; this differs from companies which began with video; they are younger and rely on local revenues.

One duplication house, North Country, reports a state of the art multiple format facility. North Country edits on C format helical, can dub to quad, all U-Matics and 1 inch. North Country has a well developed Electronic Field Production van; like the film companies, North Country's revenues, in the main, come from out of state activities.

CONCLUSION

The intent of the survey was description and identification; from such a survey, few conclusions can be drawn.

From the data, state holdings are obselete, yet, used to the maximum. If present holdings were upgraded and expanded, costs incurred would run to six figures. Any upgrading will bring with it the potential for a confusion of formats and equipment incompatability.

The activities of Montana's broadcasters and independent production houses are a reflection of Montana's sparse population and Montana's minimal use of television technology for education, training, etc. It is doubtful that Montana will grow sufficiently to create major markets for television stations, or create a a healthy economic base for private producers to rely on local revenues.

Of the three general areas surveyed, the area most likely to expand and evolve a more sophisticated television effort is in Departments of State.

ATTACHMENT E

PART IV

APPENDIX 1-A: SURVEY DOCUMENT: AGENCIES & DEPARTMENTS OF STATE

1-V-1

______	______	______	☐	☐	______	☐	☐	☐
______	______	______	☐	☐	______	☐	☐	☐
______	______	______	☐	☐	______	☐	☐	☐
______	______	______	☐	☐	______	☐	☐	☐
______	______	______	☐	☐	______	☐	☐	☐

1.) Have you set aside a permanent space for viewing videotapes? Yes ☐ No ☐

2.) If no, do you have a cart to move your equipment from room to room?

3.) How often do you have your monitors/receivers adjusted or maintained?

(6 mos. ______) (1 yr. ______) (2 yrs. ______) (no record of the last time it was done ______)

When equipment fails ____________)

4.) How often do you use your monitors?

______ Weekly ______ Monthly ______ Quarterly ______ Other

5.) What monitors/receivers do you require to meet future needs? ____________________

____

____

VIDEO TAPE MACHINES

Brand & Model	Quantity	Age	Color		Format (tape size)			Audio Dub feature		Video Edit		Field Portable	Console
			Yes	No	1"	¾"	½"	Yes	No	Yes	No		
______	______	______	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

TELEVISION CAMERAS

Brand & Model	Quantity	Age	Color Yes	Color No	# of Tubes 1	# of Tubes 2	# of Tubes 3	Field Portable	Studio Type	Lens 4×1	Lens 6×1	Lens 10×1
______	______	______	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

How often do you use your cameras?

______ Weekly ______ Monthly ______ Quarterly ______ Other

What type(s) of camera(s) do you require to carry on future television activities?

____

____

____

TRIPOD HEADS FOR VIDEO AND 16/35mm

Brand & Model	Fluid Head	Cam Head	Friction Head	Cradle Head	Tilt Head	Ball Head	Twin Head	Carrying Capacity lbs.
______	☐	☐	☐	☐	☐	☐	☐	______
______	☐	☐	☐	☐	☐	☐	☐	______
______	☐	☐	☐	☐	☐	☐	☐	______

________	________	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
________	________	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
________	________	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
________	________	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
________	________	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
________	________	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

	Yes	No
1.) For what purposes do you use your television equipment?		
1.) In house training	☐	☐
2.) Documenting speakers, etc.	☐	☐
3.) Making Public Service Announcements for Broadcast Television	☐	☐
4.) Making documentaries for Television	☐	☐
5.) Television presentations for public meetings	☐	☐
2.) Do you share your video holdings with other departments?	☐	☐

3.) How often do you receive requests for the loan of your equipment?

_______ Weekly? _______ Monthly? _______ Quarterly? _______ Other?

4.) What conditions do you place on the loan of your equipment—please list.

____

____

____

____

____

____

____

____

5.) For future purchases would you be willing to ac... and share the item? Yes ☐ No ☐

6.) What special conditions would you set for joint purchase and ownership?

____

____

____

____

____

____

____

____

7.) Do you have staff assigned to produce videotapes for the agency? Yes ☐ No ☐

(If yes, how many F.T.E.? ____________)

LIGHTS

HOW USED (Please Check)

Brand	Quantity	Fresnel Lens	Barn Doors	Watts	Spot/Flood	Key/Back	Softlight	Base/Fill	Effects
____	____	☐	☐	____	☐	☐	☐	☐	☐
____	____	☐	☐	____	☐	☐	☐	☐	☐
____	____	☐	☐	____	☐	☐	☐	☐	☐
____	____	☐	☐	____	☐	☐	☐	☐	☐
____	____	☐	☐	____	☐	☐	☐	☐	☐

1.) Do you use:

	Yes	No
Specialized Lighting Mounts	☐	☐
Scrims	☐	☐
Gels	☐	☐
Snoots	☐	☐
Light Reflectors	☐	☐
Umbrellas	☐	☐

	Yes	No
2.) Do you have distribution equipment such as plugging strips wall boxes, portable plugging boxes, etc.?	☐	☐
3.) Do you have fixtures such as dimmer banks, cold patches, control consoles, etc.?	☐	☐

MICROPHONES

Brand	Quantity	Bi Directional	Omni Directional	Cardiod	Shotgun	Dynamic or Condenser	
______	______	☐	☐	☐	☐	☐	☐
______	______	☐	☐	☐	☐	☐	☐
______	______	☐	☐	☐	☐	☐	☐
______	______	☐	☐	☐	☐	☐	☐
______	______	☐	☐	☐	☐	☐	☐

Do you have microphone mixing ability? Yes ☐ No ☐

(If yes, please list type.) ______________________________

1-A-6

1.) Staff training ☐
2.) Public Meetings ☐
3.) Television Public Service Announcements ☐

2.) Do you have staff to produce 35mm presentations? ☐ ☐

3.) Do you contract 35mm work? ☐ ☐

If yes, how often? ____________

If yes, for what type of project? ____________

4.) Do you produce 16mm films? ☐ ☐

If yes, how often? ____________

If yes, for what type of movie? ____________

5.) Do you have a film maker on staff? ☐ ☐

6.) Do you contract out 16mm work? ☐ ☐

If yes, how often? ____________

If yes, for what types of projects? ____________

Please List
35mm Equipment Owned

Camera Head Types

Lenses

Flash and Other Attachments

Do you own your own 16mm camera? Yes ☐ No ☐

If yes, please list camera ____________

lenses ____________

SoundSync tape recorder ____________

Additional magazines ____________

ATTACHMENT E

PART V

APPENDIX 1-B:

TELEVISION HOLDINGS AND ACCESSORIES

AGENCY NAMES AND CODES

1-V......STATE BOARD OF EDUCATION
Museum Program

2-V......FISH AND GAME
Film Center

3-V......HEALTH AND ENV. SCIENCES
3-Va.........Film Library
3-Vb.........Solid Waste Mngt. Bureau

4-V......DEPARTMENT OF HIGHWAYS
4-Va.........Personnel Division
4-Vb.........Preconstruction

5-V......DEPARTMENT OF INSTITUTIONS
5-Va.........Alcohol and Drug Abuse Division
5-Vb.........Warm Springs
5-Vc.........Boulder
5-Vd.........Eastmont Training Center-Glendive
5-Ve.........Galen
5-Vf.........Corrections

6-V......DEPARTMENT OF JUSTICE
6-Va.........Highway Patrol
6-Vb.........Law Enforcement Academy

7-V......LABOR AND INDUSTRY
7-Va.........Employment Security Division
7-Vb.........Worker's Compensation Division
7-Vc.........Centralized Services for Employment Training and Compliance

8-V......NATURAL RESOURCES AND CONSERVATION
8-Va.........Renewable Energy Bureau
8-Vb.........Land Use Planning division

9-V......SOCIAL AND REHABILITATION SERVICES

10-V.....OFFICE OF PUBLIC INSTRUCTION
Library Media Component

35-1.....ADMINISTRATION
Communications Division

35-2.....DEPARTMENT OF AGRICULTURE
Directors Office

35-3.....OFFICE OF THE GOVERNOR

35-4.....DEPARTMENT OF LANDS
Commissioner's Office

AGENCY NAMES AND CODES CONTINUED

35-5.....DEPARTMENT OF HIGHWAYS
35-5a........Photo Unit
35-5b........Travel Promotions

35-6.....DEPARTMENT OF JUSTICE
35-6a........Fire Marshal
35-6b........Criminal Investigation Bureau
35-6c........Board of Crime Control

TELEVISION MONITORS AND OR RECEIVERS

NC CODE	BRAND AND MODEL	QUANTITY	BLACK & WHITE	COLOR	MONITOR	RECEIVER
3-	-	-	-	-	-	-
-V	SONY	2	-	X	X	X
3-Va	SONY 1978 & CVM 1973	2	X	X	X	-
3-Vb	SONY & HITACHI	2	-	X	X	X
4-Va	RCA Lyceum & PANASONIC CT 1910	2	-	X	X	-
4Vb	BLANK	1	X	-	X	-
5Va	SONY	2	X	-	X	X
5Vb	SONY & BETAMAX	2	X	-	X	X
5Vc	SONY	1	X	-	X	X
5Vd	SONY & MAGNAVOX	2	X	-	X	X
5-Ve	Sony	1	-	X	X	-
5-Vf	3 SONY & 1 HITACHI	4	X	X	X	X
-Va	SONY	1	X	-	X	X
-Vb	SONY & PANASONIC	2	X	X	X	X
-Va	5 SONY & 1 HITACHI	6	X	X	X	X
-Vb	CONCORD MR700 & TOSHIBA V5	2	-	X	X	-
-Vc	PANASONIC	1	-	X	X	-
-Va	PANASONIC CT-911VA & CT-1310	2	-	X	X	-
-Vb	RCA	1	X	-	-	X
-V	SONY	4	X	-	X	X
0-V	2 SONY & 1 HITACHI	3	X	X	X	X

VIDEOTAPE MACHINES

GNCY CODE	BRAND AND MODEL	QUANTITY	COLOR	FORMAT
1-V	SONY VP 1200	1	X	3/4"
2-V	SONY U-MATIC	2	X	3/4"
3-Va	SONY VO 2600 & SONY AV3600	2	X	3/4"
3-Vb	SONY VO 1800, SONY VP1000 PANASONIC NU 8400	3	X	2-3/4" 1-1/2"
4-Va	PANASONIC	1	BLANK	3/4"
4-Vb	SONY & PANASONIC	2	BLANK	1/2"
5-Va	SONY AV 3400 & SONY	2	BLANK	1/2" & 3/4"
5Vb	SONY & BETAMAX	2	BLANK	BLANK
5-Vc	SONY AV 3650 & Sony	2	BLANK	1/2"
5-Vd	SONY	1	BLANK	1/2"
5-Ve	2 SONY	2	BLANK	1" & 1/2"
5-Vf	1 SONY AV 8400 & 1 SONY AV 3400 2 SONY SLP 100	4	(SLP) X	1/2"
6-Va	SONY	1	BLANK	1/2"
6-Vb	2 SONY VP 1200 & 5 SONY VP 1000	7	x	3/4"
7-Va	3 SONY, 1 JVC, & 1 PANASONIC	5	x	2-1/2" 1-3/4"
7-Vb	CONCORD VTR 800	1	X	3/4"
7-Vc	PANASONIC	1	X	3/4"
8-Va	PANASONIC 9000 6-2	1	x	3/4"

VIDEOTAPE MACHINES CONTINUED

ENCY CODE	BRAND AND MODEL	QUANTITY	COLOR	FORMAT
8-Vb	VCR CR-6060 U	1	X	1-3/4"
9-V	2 SONY 3650, 2 SONY 3600 1 SONY VP 2000	5	X	2-1/2" 1-3/4"
10-V	SONY	4	X	1-3/4" 3-1/2"

TELEVISION CAMERAS

.NY CODE	BRAND AND MODEL	QUANTITY	COLOR	LENS
]-V	NONE	-	-	-
?-V	None	-	-	-
-Va	SONY AVC 3200	1	BLANK	BLANK
-Vb	PANASONIC WV 3320	1	x	6X1
-Va	NONE	-	-	-
-Vb	SONY	1	X	BLANK
-Va	SONY 3400 & SONY AVC 3260	2	BLANK	4X1
-Vb	SONY & BETAMAX	2	BLANK	BLANK
-Vc	2 SONY	2	BLANK	2X1 4X1
-Vd	SONY	1	X	ZOOM
-Ve	NONE	-	-	-
-Vf	SONY AVC 3450	1	BLANK	4X1
-Va	SONY	1	BLANK	4X1
-Vb	NONE	-	-	-
-Va	9 SONY, 2 JVC & 8 PANASONIC	19	X	4x1 6X1
-Vb	CONCORD MTC 18 & CONCORD TCM 20	2	X	4X1 10X1
-Vc	NONE	-	-	-

TELEVISION CAMERAS

.GNCY CODE	BRAND AND MODEL	QUANTITY	COLOR	LENS
8-Va	NONE	-	-	-
8-Vb	RCA TC 1005 & RCA INFARED	2	BLANK	6X1
9-V	SONY AVC 3200	4	BLANK	ZOOM
10-V	SONY AVC 3450 & SONY AVC 3400	2	BLANK	BLANK

TRIPODS FOR VIDEO AND 16/35mm

ENCY CODE	BRAND AND MODEL	QUANTITY	HEAD TYPE
1-V	VIVITAR & DAVUDSON	2	BLANK
2-V	MILLER JR., O'CONNOR & AURILON	3	2 FLUID 1 FRICTION
3-Va	NONE	-	-
3-Vb	CHALLENGER	1	BLANK
4-Va	NONE	-	-
4-Vb	SONY	1	FRICTION
5-Va	SONY VCT 20A	1	Friction
5-Vb	NONE	-	-
5-Vc	BLANK	1	TILT HEAD
5-Vd	SONY	1	BALL HEAD
5-Ve	NONE	-	-
5-Vf	NONE	-	-
6-Va	NONE	-	-
6-Vb	BLANK	1	BLANK
7-Va	SONY, HUSKY, DAVIS STANDARD	3	BLANK
7-Vb	NONE	-	-
7-Vc	NONE	-	-
8-Va	NONE	-	-
8-Vb	NONE	-	-
9-V	SAMPSON QUICK SET 7481 HUSKY QUICK SET	3	CRADLE HEAD TILT HEAD
10-V	NONE	-	-

MICROPHONES

NC CODE	BRAND AND MODEL	QUANTITY	TYPE
1-V	NONE	-	-
2 V	SENNHEISER 815, SHURE SM 7 ELECTROVOICE RE41	3	SHOTGUN CARDIOD
3 Va	NONE	-	-
3 Vb	SONY, LAFAYETTE & SONY	3	1 OMNI DIR. 2 CARDIOD
4 Va	NONE	-	-
4 Vb	NONE	-	-
5A	SPHER-O-DYNE, UNIDYNE &NORELCO	3	2 OMNI DIR. 1 BI DIR.
5 Vb	SONY & BETAMAX	2	OMNI DIR.
5 Vc	SONY	3	ONMI DIR.
5 Vd	SONY	1	OMNI DIR.
5-Ve	NONE	-	-
5-Vf	NONE	-	-
-Va	NONE	-	-
-Vb	NONE	-	-
-Va	SONY	15	BI DIR, OMNI DIR CARDIOD
-Vb	NONE	-	-
-VC	NONE	-	-
-Va	NONE	-	-
-Vb	NONE	-	-
-V	TOA DM 902 & SONY ECM 16	5	OMNI DIR.
0-V	NONE	-	-

LIGHTS

ECY CODE	BRAND AND MODEL	QUNATITY	ACCESSORIES
1-V	NONE	-	-
2-V	LOWEC COLOR TRAIN & NUMEROUS STUDIO LIGHTS	6	X
3-Va	NONE	-	-
3-Vb	NONE	-	-
4-Va	NONE	-	-
4-Vb	NONE	-	-
5-Va	NONE	-	-
5-Vb	NONE	-	-
5-Vc	NONE	-	-
5-Vd	NONE	-	-
5-Ve	NONE	-	-
5-Vf	NONE	-	-
6-Va	NONE	-	-
6-Vb	NONE	-	-
7-Va	SMITH VICTOR	1 SET OF 3	-
7-Vb	NONE	-	-
7-Vc	NONE	-	-
8-VA	NONE	-	-
8-VB	NONE	-	-
9-V	ACME LITE	3	-
10-V	NONE	-	-

ATTACHMENT E

PART VI

5-TELEVISION PRESENTATIONS AT PUBLIC MEETINGS?

STATE BOARD OF EDUCATION	
Museum Program	NO USAGE, BUT WOULD FOR PUBLIC MEETINGS
FISH AND GAME	
Film Center	1,4,5
HEALTH AND ENV. SCIENCES	
Film Library	1,2,5
Solid Waste Mngt. Bureau	1,2,5
DEPT. OF HIGHWAYS	
Personnel Division	NO ANSWER
Preconstruction	1,2,5
DEPT. OF INSTITUTIONS	
Alcohol and Drug Abuse Div.	1,2
Warm Springs	1,2,5
Boulder River School	1,5
Eastman Training Center-Glendive	1,2
Galen	NO ANSWER
Corrections	1,2
DEPT. OF JUSTICE	
Highway Patrol	1,5
Law Enforcement Academy	1,2,4,5
LABOR AND INDUSTRY	
Employment Security Div.	1,2,5
Worker's Compensation Div.	1,2,5
Centralized Services/Training & Compliance	1
NATURAL RESOURCES AND CONSERVATION	
Renewable Energy Bureau	1,3,4
Land Use Planning Div.	5
SOCIAL AND REHABILITATION SERVICES	
T.R.I.C.	1,2,5
OFFICE OF PUBLIC INSTRUCTION	
Library Media Component	2

STATE BOARD OF EDUCATION	
Museum Program	NO MONITORS
FISH AND GAME	
Film Center	WEEKLY
HEALTH AND ENV. SCIENCES	
Film Library	WEEKLY
Solid Waste Mngt. Bureau	MONTHLY
DEPT. OF HIGHWAYS	
Personnel Division	NO ANSWER
Preconstruction	NO PATTERN
DEPT. OF INSTITUTIONS	
Alcohol and Drug Abuse Div.	MONTHLY
Warm Springs	WEEKLY
Boulder River School	WEEKLY
Eastman Training Center-Glendive	QUARTERLY
Galen	DAILY
Corrections	MONTHLY
DEPT. OF JUSTICE	
Highway Patrol	SEMI-ANNUALLY
Law Enforcement Academy	WEEKLY
LABOR AND INDUSTRY	
Employment Security Div.	WEEKLY
Worker's Compensation Div.	MONTHLY
Centralized Services/Training & Compliance	OTHER
NATURAL RESOURCES AND CONSERVATION	
Renewable Energy Bureau	MONTHLY
Land Use Planning Div.	MONTHLY
SOCIAL AND REHABILITATION SERVICES	
T.R.I.C.	WEEKLY
OFFICE OF PUBLIC INSTRUCTION	
Library Media Component	OTHER

... VIDEOTAPE MACHINES?

STATE BOARD OF EDUCATION	
Museum Program	NO ANSWER
FISH AND GAME	
Film Center	WEEKLY
HEALTH AND ENV. SCIENCES	
Film Library	WEEKLY
Solid Waste Mngt. Bureau	WEEKLY
DEPT. OF HIGHWAYS	
Personnel Division	NO ANSWER
Preconstruction	OTHER
DEPT. OF INSTITUTIONS	
Alcohol and Drug Abuse Div.	MONTHLY
Warm Springs	NO ANSWER
Boulder River School	WEEKLY
Eastman Training Center-Glendive	QUARTERLY
Galen	DAILY
Corrections	MONTHLY
DEPT. OF JUSTICE	
Highway Patrol	MONTHLY
Law Enforcement Academy	WEEKLY
LABOR AND INDUSTRY	
Employment Security Div.	WEEKLY
Worker's Compensation Div.	OTHER
Centralized Services/Training & Compliance	OTHER
NATURAL RESOURCES AND CONSERVATION	
Renewable Energy Bureau	MONTHLY
Land Use Planning Div.	MONTHLY
SOCIAL AND REHABILITATION SERVICES	
T.R.I.C.	WEEKLY
OFFICE OF PUBLIC INSTRUCTION	
Library Media Component	WEEKLY

	ANSWER
STATE BOARD OF EDUCATION	
Museum Program	NO ANSWER
FISH AND GAME	
Film Center	NOT APPLICABLE
HEALTH AND ENV. SCIENCES	
Film Library	OTHER
Solid Waste Mngt. Bureau	WEEKLY
DEPT. OF HIGHWAYS	
Personnel Division	NO ANSWER
Preconstruction	OTHER
DEPT. OF INSTITUTIONS	
Alcohol and Drug Abuse Div.	MONTHLY
Warm Springs	NO ANSWER
Boulder River School	WEEKLY
Eastman Training Center-Glendive	QUARTERLY
Galen	NOT APPLICABLE
Corrections	MONTHLY
DEPT. OF JUSTICE	
Highway Patrol	NOT APPLICABLE
Law Enforcement Academy	NOT APPLICABLE
LABOR AND INDUSTRY	
Employment Security Div.	WEEKLY
Worker's Compensation Div.	OTHER
Centralized Services/Training & Compliance	NOT APPLICABLE
NATURAL RESOURCES AND CONSERVATION	
Renewable Energy Bureau	MONTHLY
Land Use Planning Div.	NOT APPLICABLE
SOCIAL AND REHABILITATION SERVICES	
T.R.I.C.	MONTHLY
OFFICE OF PUBLIC INSTRUCTION	
Library Media Component	OTHER

AGENCY NAME	QUESTION: DO YOU HAVE STAFF ASSIGNED TO PRODUCE VIDEO FOR THE AGENCY?
STATE BOARD OF EDUCATION	
Museum Program	NO
FISH AND GAME	
Film Center	NO
HEALTH AND ENV. SCIENCES	
Film Library	NO
Solid Waste Mngt. Bureau	NO
DEPT. OF HIGHWAYS	
Personnel Division	NO ANSWER
Preconstruction	NO
DEPT. OF INSTITUTIONS	
Alcohol and Drug Abuse Div.	NO
Warm Springs	NO
Boulder River School	NO
Eastman Training Center-Glendive	NO
Galen	NO ANSWER
Corrections	NO
DEPT. OF JUSTICE	
Highway Patrol	NO
Law Enforcement Academy	NO
LABOR AND INDUSTRY	
Employment Security Div.	NO
Worker's Compensation Div.	NO
Centralized Services/Training & Compliance	NO
NATURAL RESOURCES AND CONSERVATION	
Renewable Energy Bureau	NO
Land Use Planning Div.	NO
SOCIAL AND REHABILITATION SERVICES	
T.R.I.C.	YES, THREE FTE
OFFICE OF PUBLIC INSTRUCTION	
Library Media Component	NO

VIDEOTAPES?	ANSWER
STATE BOARD OF EDUCATION	
Museum Program	NO ANSWER
FISH AND GAME	
Film Center	YES
HEALTH AND ENV. SCIENCES	
Film Library	NO ANSWER
Solid Waste Mngt. Bureau	NO
DEPT. OF HIGHWAYS	
Personnel Division	NO
Preconstruction	NO
DEPT. OF INSTITUTIONS	
Alcohol and Drug Abuse Div.	NO
Warm Springs	YES
Boulder River School	NO
Eastman Training Center-Glendive	NO
Galen	YES
Corrections	NO
DEPT. OF JUSTICE	
Highway Patrol	NO
Law Enforcement Academy	YES
LABOR AND INDUSTRY	
Employment Security Div.	NO
Worker's Compensation Div.	YES
Centralized Services/Training & Compliance	NO
NATURAL RESOURCES AND CONSERVATION	
Renewable Energy Bureau	NO
Land Use Planning Div.	YES
SOCIAL AND REHABILITATION SERVICES	
T.R.I.C.	YES
OFFICE OF PUBLIC INSTRUCTION	
Library Media Component	YES

	FROM ROOM TO ROOM?	ANSWER
STATE BOARD OF EDUCATION		
Museum Program		NO ANSWER
FISH AND GAME		
Film Center		NOT APPLICABLE
HEALTH AND ENV. SCIENCES		
Film Library		YES
Solid Waste Mngt. Bureau		YES
DEPT. OF HIGHWAYS		
Personnel Division		YES
Preconstruction		NO
DEPT. OF INSTITUTIONS		
Alcohol and Drug Abuse Div.		NO
Warm Springs		NOT APPLICABLE
Boulder River School		YES
Eastman Training Center-Glendive		YES
Galen		NO ANSWER
Corrections		NO
DEPT. OF JUSTICE		
Highway Patrol		YES
Law Enforcement Academy		NOT APPLICABLE
LABOR AND INDUSTRY		
Employment Security Div.		YES
Worker's Compensation Div.		NOT APPLICABLE
Centralized Services/Training & Compliance		YES
NATURAL RESOURCES AND CONSERVATION		
Renewable Energy Bureau		YES
Land Use Planning Div.		NOT APPLICABLE
SOCIAL AND REHABILITATION SERVICES		
T.R.I.C.		NOT APPLICABLE
OFFICE OF PUBLIC INSTRUCTION		
Library Media Component		YES

AGENCY NAME	QUESTION: HOW OFTEN DO YOU HAVE YOUR MONITORS/RECEIVERS ADJUSTED OR MAINTAINED?
STATE BOARD OF EDUCATION	
Museum Program	NO ANSWER
FISH AND GAME	
Film Center	NO RECORD
HEALTH AND ENV. SCIENCES	
Film Library	ANNUALLY
Solid Waste Mngt. Bureau	WHEN IT FAILS, 2 YEARS
DEPT. OF HIGHWAYS	
Personnel Division	NO ANSWER
Preconstruction	NO RECORD
DEPT. OF INSTITUTIONS	
Alcohol and Drug Abuse Div.	WHEN IT FAILS
Warm Springs	WHEN IT FAILS
Boulder River School	WHEN IT FAILS
Eastman Training Center-Glendive	WHEN IT FAILS
Galen	WHEN IT FAILS
Corrections	WHEN IT FAILS
DEPT. OF JUSTICE	
Highway Patrol	NO RECORD
Law Enforcement Academy	ANNUALLY
LABOR AND INDUSTRY	
Employment Security Div.	WHEN IT FAILS
Worker's Compensation Div.	WHEN IT FAILS
Centralized Services/Training & Compliance	WHEN IT FAILS
NATURAL RESOURCES AND CONSERVATION	
Renewable Energy Bureau	WHEN IT FAILS
Land Use Planning Div.	WHEN IT FAILS
SOCIAL AND REHABILITATION SERVICES	
T.R.I.C.	1 YEAR
OFFICE OF PUBLIC INSTRUCTION	
Library Media Component	NO RECORD

AGENCY NAME | QUESTION: WHAT TYPE(S) OF VIDEOTA[illegible] REQUIRE TO CARRY ON FUTURE TELEVISION ACTIVITIES? | ANSWER

AGENCY NAME	ANSWER
STATE BOARD OF EDUCATION	
Museum Program	NO ANSWER
FISH AND GAME	
Film Center	UNKNOWN
HEALTH AND ENV. SCIENCES	
Film Library	WOULD FIND OTHER DEPTS. UNITS O.K.
Solid Waste Mngt. Bureau	"NONE"
DEPT. OF HIGHWAYS	
Personnel Division	NO ANSWER
Preconstruction	SATISFIED WITH PRESENT SYSTEM
DEPT. OF INSTITUTIONS	
Alcohol and Drug Abuse Div.	NO ANSWER
Warm Springs	NO ANSWER
Boulder River School	"NONE"
Eastman Training Center-Glendive	NO ANSWER
Galen	NO ANSWER
Corrections	NO BUDGET FOR UPGRADING
DEPT. OF JUSTICE	
Highway Patrol	BETA 1/2 INCH FORMAT
Law Enforcement Academy	REPLACEMENTS- 3/4 INCH
LABOR AND INDUSTRY	
Employment Security Div.	6 1/2 CASSETTES & 1 FIELD PORTABLE
Worker's Compensation Div.	UNDETERMINED
Centralized Services/Training & Compliance	NO ANSWER
NATURAL RESOURCES AND CONSERVATION	
Renewable Energy Bureau	FIELD PORTABLE 3/4 INCH
Land Use Planning Div.	PORTABLE 1/2 INCH VCR
SOCIAL AND REHABILITATION SERVICES	
T.R.I.C.	3/4 INCH EDITING WITH SPECIAL EFFECTS
OFFICE OF PUBLIC INSTRUCTION	
Library Media Component	NO ANSWER

AGENCY NAME	QUESTION: WHAT TYPE(S) OF MONITORS/RECEIVERS DO ... REQUIRE TO MEET FUTURE NEEDS?
STATE BOARD OF EDUCATION	
Museum Program	NO ANSWER
FISH AND GAME	
Film Center	NOT KNOWN AT PRESENT
HEALTH AND ENV. SCIENCES	
Film Library	NO ANSWER
Solid Waste Mngt. Bureau	"NONE"
DEPT. OF HIGHWAYS	
Personnel Division	NO ANSWER
Preconstruction	NO ANSWER
DEPT. OF INSTITUTIONS	
Alcohol and Drug Abuse Div.	"NOT SURE AT PRESENT"
Warm Springs	NO ANSWER
Boulder River School	"NONE"
Eastman Training Center-Glendive	NO ANSWER
Galen	NO ANSWER
Corrections	"NEED THEM ALL"
DEPT. OF JUSTICE	
Highway Patrol	ADDITIONAL
Law Enforcement Academy	ADDITIONAL
LABOR AND INDUSTRY	
Employment Security Div.	1 COLOR PORTABLE AND 6 "19"s TO REPLACE BLACK & white
Worker's Compensation Div.	UNDETERMINED
Centralized Services/Training & Compliance	NO ANSWER
NATURAL RESOURCES AND CONSERVATION	
Renewable Energy Bureau	"NONE"
Land Use Planning Div.	19 INCH MONITOR/RECEIVER
SOCIAL AND REHABILITATION SERVICES	
T.R.I.C.	COLOR TO MATCH VIDEO CASSETTES
OFFICE OF PUBLIC INSTRUCTION	
Library Media Component	"NONE

AGENCY NAME	QUESTION: WHAT TYPE(S) OF CAMERA(S) ... TO CARRY ON FUTURE TELEVISION ACTIVITIES? ANSWER
STATE BOARD OF EDUCATION	
Museum Program	NO ANSWER
FISH AND GAME	
Film Center	"UNDETERMINED"
HEALTH AND ENV. SCIENCES	
Film Library	COLOR FOR CONFERENCE TAPING
Solid Waste Mngt. Bureau	"NONE"
DEPT. OF HIGHWAYS	
Personnel Division	NO ANSWER
Preconstruction	CAMERA IS ADIQUATE
DEPT. OF INSTITUTIONS	
Alcohol and Drug Abuse Div.	SUFFICIENT
Warm Springs	NO ANSWER
Boulder River School	"NONE"
Eastman Training Center-Glendive	NO ANSWER
Galen	NO ANSWER
Corrections	"NO BUDGET"
DEPT. OF JUSTICE	
Highway Patrol	BETA COMPATIBLE
Law Enforcement Academy	NO ANSWER
LABOR AND INDUSTRY	
Employment Security Div.	6 STUDIO & 1 FIELD
Worker's Compensation Div.	"UNDERTERMINED"
Centralized Services/Training & Compliance	NO ANSWER
NATURAL RESOURCES AND CONSERVATION	
Renewable Energy Bureau	FIELD PORTABLE
Land Use Planning Div.	NONE
SOCIAL AND REHABILITATION SERVICES	
T.R.I.C.	CAMERA TO YOKE TO 3/4 INCH
OFFICE OF PUBLIC INSTRUCTION	
Library Media Component	NO ANSWER

AGENCY NAME	QUESTION: DO YOU SHARE YOUR VIDEO HOLDINGS WITH OTHER DEPARTMENTS?
STATE BOARD OF EDUCATION	
Museum Program	NO
FISH AND GAME	
Film Center	YES
HEALTH AND ENV. SCIENCES	
Film Library	TAPES-YES MACHINES-NO
Solid Waste Mngt. Bureau	NO
DEPT. OF HIGHWAYS	
Personnel Division	NO ANSWER
Preconstruction	YES
DEPT. OF INSTITUTIONS	
Alcohol and Drug Abuse Div.	YES, OCCASIONALLY
Warm Springs	NO
Boulder River School	NO
Eastman Training Center-Glendive	NO
Galen	NO ANSWER
Corrections	YES
DEPT. OF JUSTICE	
Highway Patrol	NO
Law Enforcement Academy	YES
LABOR AND INDUSTRY	
Employment Security Div.	YES
Worker's Compensation Div.	NO
Centralized Services/Training & Compliance	NO ANSWER
NATURAL RESOURCES AND CONSERVATION	
Renewable Energy Bureau	NO ANSWER
Land Use Planning Div.	YES
SOCIAL AND REHABILITATION SERVICES	
T.R.I.C.	YES
OFFICE OF PUBLIC INSTRUCTION	
Library Media Component	no answer

AGENCY NAME	QUESTION: HOW OFTEN DO YOU RECEIVE REQUESTS FOR THE LOAN OF YOUR EQUIPTMENT?
STATE BOARD OF EDUCATION	
Museum Program	WEEKLY, IN HOUSE
FISH AND GAME	
Film Center	QUARTERLY
HEALTH AND ENV. SCIENCES	
Film Library	MONTHLY
Solid Waste Mngt. Bureau	NO ANSWER
DEPT. OF HIGHWAYS	
Personnel Division	NO ANSWER
Preconstruction	INFREQUENTLY, NC PATTERN
DEPT. OF INSTITUTIONS	
Alcohol and Drug Abuse Div.	NO PATTERN
Warm Springs	NEVER
Boulder River School	NEVER
Eastman Training Center-Glendive	NEVER
Galen	NO ANSWER
Corrections	QUARTERLY
DEPT. OF JUSTICE	
Highway Patrol	NEVER
Law Enforcement Academy	WEEKLY
LABOR AND INDUSTRY	
Employment Security Div.	MONTHLY
Worker's Compensation Div.	NO PATTERN
Centralized Services/Training & Compliance	NO PATTERN
NATURAL RESOURCES AND CONSERVATION	
Renewable Energy Bureau	NO ANSWER
Land Use Planning Div.	MONTHLY
SOCIAL AND REHABILITATION SERVICES	
T.R.I.C.	QUARTERLY
OFFICE OF PUBLIC INSTRUCTION	
Library Media Component	NO PATTERN

AGENCY NAME	QUESTION: WHAT CONDITIONS DO YOU PLACE ON THE LOAN OF YOUR EQUIPTMENT?
STATE BOARD OF EDUCATION	
Museum Program	MUST SIGN IT OUT
FISH AND GAME	
Film Center	WOULD PERMIT USE BUT HAVE HAD BAD EXPERIENCES-WILL LIMIT USE TO DEPT. OF HEALTH
HEALTH AND ENV. SCIENCES	
Film Library	
Solid Waste Mngt. Bureau	
DEPT. OF HIGHWAYS	
Personnel Division	
Preconstruction	NO SPECIAL CONDITIONS
DEPT. OF INSTITUTIONS	
Alcohol and Drug Abuse Div.	REPAIR OR REPLACE, PROVIDE SECURITY PROVIDE OPERATOR
Warm Springs	
Boulder River School	
Eastman Training Center-Glendive	
Galen	
Corrections	RETURN IN SAME CONDITION OR REPAIR
DEPT. OF JUSTICE	
Highway Patrol	
Law Enforcement Academy	RETURN CLEAN AND IN WORKING CON-DITION/NO DAMAGE
LABOR AND INDUSTRY	PROPER CARE AND ACCEPT RESPONSIBIL-
Employment Security Div.	ITY FOR DAMAGE, REPAIR, REPLACE
Worker's Compensation Div.	CONDITIONS SET BY DEPT. HEAD
Centralized Services/Training & Compliance	RETURN IN EXCELLENT CONDITION
NATURAL RESOURCES AND CONSERVATION	
Renewable Energy Bureau	WILLING TO MAKE EQUIP. AVAILABLE
Land Use Planning Div.	PRESENTLY BEING FORMULATED
SOCIAL AND REHABILITATION SERVICES	
T.R.I.C.	BE RESPONSIBLE FOR LOSS OR DAMAGE
OFFICE OF PUBLIC INSTRUCTION	
Library Media Component	EQUIPTMENT RENTED BUT NOT TO LEAVE HELENA

AGENCY NAME	QUESTION: FOR FUTURE PURCHASES, WOULD ... ACQUIRE HARDWARE JOINTLY WITH ANOTHER AGENCY AND SHARE THE ITEM?	ANSWER
STATE BOARD OF EDUCATION		
Museum Program		NO
FISH AND GAME		
Film Center		NO
HEALTH AND ENV. SCIENCES		
Film Library		NOT PERMITTED/GENERALY NOTPOSSIBLE
Solid Waste Mngt. Bureau		YES
DEPT. OF HIGHWAYS		
Personnel Division		NO ANSWER
Preconstruction		NO ANSWER
DEPT. OF INSTITUTIONS		
Alcohol and Drug Abuse Div.		NO
Warm Springs		NO ANSWER
Boulder River School		NO
Eastman Training Center-Glendive		YES
Galen		NO ANSWER
Corrections		YES
DEPT. OF JUSTICE		
Highway Patrol		YES
Law Enforcement Academy		YES
LABOR AND INDUSTRY		
Employment Security Div.		NO
Worker's Compensation Div.		ADMINISTRATIVE DECISION N/A
Centralized Services/Training & Compliance		NOT APPLICABLE
NATURAL RESOURCES AND CONSERVATION		
Renewable Energy Bureau		YES
Land Use Planning Div.		YES
SOCIAL AND REHABILITATION SERVICES		
T.R.I.C.		YES
OFFICE OF PUBLIC INSTRUCTION		
Library Media Component		NO ANSWER

AGENCY NAME	QUESTION: WHAT SPECIAL CONDITIONS WOULD YOU SET FOR JOINT PURCHASE AND OWNERSHIP?
STATE BOARD OF EDUCATION	
Museum Program	
FISH AND GAME	
Film Center	
HEALTH AND ENV. SCIENCES	
Film Library	
Solid Waste Mngt. Bureau	NO ANSWER
DEPT. OF HIGHWAYS	
Personnel Division	
Preconstruction	
DEPT. OF INSTITUTIONS	
Alcohol and Drug Abuse Div.	
Warm Springs	
Boulder River School	
Eastman Training Center-Glendive	TO BE WORKED OUT
Galen	
Corrections	50% USE
DEPT. OF JUSTICE	
Highway Patrol	UNKNOWN
Law Enforcement Academy	AVAILABLE TO LAW ENFORCEMENT UNITS
LABOR AND INDUSTRY	
Employment Security Div.	
Worker's Compensation Div.	QUESTIONS WOULD HAVE TO BE WORKED OUT ON POLICY LEVEL
Centralized Services/Training & Compliance	
NATURAL RESOURCES AND CONSERVATION	
Renewable Energy Bureau	
Land Use Planning Div.	COMPATABLE AND COMPLIMENTRY UNDECIDED
SOCIAL AND REHABILITATION SERVICES	
T.R.I.C.	UNKNOWN
OFFICE OF PUBLIC INSTRUCTION	
Library Media Component	

AGENCY NAME	QUESTION: DOES YOUR AGENCY USE 35mm SLIDE ... 1-STAFF TRAINING, 2-PUBLIC MEETINGS, 3-TELEVISION PSA's	ANSWER
STATE BOARD OF EDUCATION		
Museum Program		1,2,3
FISH AND GAME		
Film Center		2
HEALTH AND ENV. SCIENCES		
Film Library		1,2,3
Solid Waste Mngt. Bureau		1,2
DEPT. OF HIGHWAYS		
Personnel Division		-
Preconstruction		1
DEPT. OF INSTITUTIONS		
Alcohol and Drug Abuse Div.		2
Warm Springs		1,2
Boulder River School		1
Eastman Training Center-Glendive		-
Galen		-
Corrections		-
DEPT. OF JUSTICE		
Highway Patrol		-
Law Enforcement Academy		1
LABOR AND INDUSTRY		
Employment Security Div.		1,2
Worker's Compensation Div.		-
Centralized Services/Training & Compliance		-
NATURAL RESOURCES AND CONSERVATION		
Renewable Energy Bureau		1,2
Land Use Planning Div.		1,2
SOCIAL AND REHABILITATION SERVICES		
T.R.I.C.		1,2
OFFICE OF PUBLIC INSTRUCTION		
Library Media Component		-

FOR? 1-STAFF TRAINING 2-PUBLIC MEETINGS 3-TELEVISION PSA's

ADMINISTRATION	
Communications Division	-
DEPARTMENT OF AGRICULTURE	
Directors Office	1,2,3
OFFICE OF THE GOVERNOR	-
DEPARTMENT OF LANDS	
COMMISSIONERS OFFICE	1,2
DEPARTMENT OF HIGHWAYS	
Photo Unit	1,2,3
Travel Promotions	-
DEPARTMENT OF JUSTICE	
Fire Marshal	1
Criminal Investigation Bureau	-
Board of Crime Control	-

AGENCY NAME	QUESTION: DO YOU HAVE STAFF TO PRODUCE	ANSWER
STATE BOARD OF EDUCATION		
Museum Program		YES
FISH AND GAME		
Film Center		YES
HEALTH AND ENV. SCIENCES		
Film Library		YES
Solid Waste Mngt. Bureau		YES
DEPT. OF HIGHWAYS		
Personnel Division		NO ANSWER
Preconstruction		YES
DEPT. OF INSTITUTIONS		
Alcohol and Drug Abuse Div.		NO
Warm Springs		NO
Boulder River School		NO
Eastman Training Center-Glendive		NO ANSWER
Galen		NO ANSWER
Corrections		NO ANSWER
DEPT. OF JUSTICE		
Highway Patrol		NO ANSWER
Law Enforcement Academy		NO
LABOR AND INDUSTRY		
Employment Security Div.		NO
Worker's Compensation Div.		NO/ACTIVITY
Centralized Services/Training & Compliance		NO/ACTIVITY
NATURAL RESOURCES AND CONSERVATION		
Renewable Energy Bureau		YES
Land Use Planning Div.		NO
SOCIAL AND REHABILITATION SERVICES		
T.R.I.C.		NO
OFFICE OF PUBLIC INSTRUCTION		
Library Media Component		NO

PRESENTATIONS? ANSWER

ADMINISTRATION	
Communications Division	NO
DEPARTMENT OF AGRICULTURE	
Directors Office	YES
OFFICE OF THE GOVERNOR	NO-HOWEVER DOES HAVE EQUIPTMENT
DEPARTMENT OF LANDS	
COMMISSIONERS OFFICE	NO-HOWEVER DOES HAVE EQUIPTMENT TO LEND OUT
DEPARTMENT OF HIGHWAYS	
Photo Unit	YES
Travel Promotions	NO
DEPARTMENT OF JUSTICE	
Fire Marshal	YES
Criminal Investigation Bureau	NO-HAS EQUIPTMENT,NO STAFF,NO CONTRACTING
Board of Crime Control	YES

AGENCY NAME	ANSWER
QUESTION: IF YES, FOR WHAT TYPE PROJECT?	
STATE BOARD OF EDUCATION	
Museum Program	NO
FISH AND GAME	
Film Center	NO
HEALTH AND ENV. SCIENCES	
Film Library	YES/PSA's & TRAINING, SEVERAL
Solid Waste Mngt. Bureau	NO
DEPT. OF HIGHWAYS	
Personnel Division	NO ANSWER
Preconstruction	NO
DEPT. OF INSTITUTIONS	
Alcohol and Drug Abuse Div.	NO
Warm Springs	NO
Boulder River School	NO
Eastman Training Center-Glendive	NO
Galen	NO
Corrections	NO
DEPT. OF JUSTICE	
Highway Patrol	NO ANSWER
Law Enforcement Academy	NO
LABOR AND INDUSTRY	
Employment Security Div.	NO
Worker's Compensation Div.	NO
Centralized Services/Training & Compliance	NO
NATURAL RESOURCES AND CONSERVATION	
Renewable Energy Bureau	NO
Land Use Planning Div.	NO
SOCIAL AND REHABILITATION SERVICES	
T.R.I.C.	NO
OFFICE OF PUBLIC INSTRUCTION	
Library Media Component	NO

AGENCY NAME	QUESTION: ... OFTEN? IF YES, FOR WHAT TYPE PROJECT?	ANSWER
ADMINISTRATION		
Communications Division		NO
DEPARTMENT OF AGRICULTURE		
Directors Office		YES,SELDOM, PUBLIC MEETINGS
OFFICE OF THE GOVERNOR		NO
DEPARTMENT OF LANDS		
COMMISSIONERS OFFICE		NO ANSWER
DEPARTMENT OF HIGHWAYS		
Photo Unit		YES, SELDOM
Travel Promotions		YES, SELDOM
DEPARTMENT OF JUSTICE		
Fire Marshal		NO
Criminal Investigation Bureau		NO ANSWER
Board of Crime Control		NO

STATE BOARD OF EDUCATION	
Museum Program	NO
FISH AND GAME	
Film Center	YES
HEALTH AND ENV. SCIENCES	
Film Library	NO
Solid Waste Mngt. Bureau	1 ANNUALLY FOR TELEVISION
DEPT. OF HIGHWAYS	
Personnel Division	NO ANSWER
Preconstruction	NO
DEPT. OF INSTITUTIONS	
Alcohol and Drug Abuse Div.	NO
Warm Springs	NO
Boulder River School	NO
Eastman Training Center-Glendive	NO
Galen	NO
Corrections	NO
DEPT. OF JUSTICE	
Highway Patrol	NO ANSWER
Law Enforcement Academy	NO
LABOR AND INDUSTRY	
Employment Security Div.	NO
Worker's Compensation Div.	NO
Centralized Services/Training & Compliance	NO
NATURAL RESOURCES AND CONSERVATION	
Renewable Energy Bureau	NO
Land Use Planning Div.	NO
SOCIAL AND REHABILITATION SERVICES	
T.R.I.C.	NO
OFFICE OF PUBLIC INSTRUCTION	
Library Media Component	NO

ADMINISTRATION	
Communications Division	NO
DEPARTMENT OF AGRICULTURE	
Directors Office	NO
OFFICE OF THE GOVERNOR	NO
DEPARTMENT OF LANDS	
COMMISSIONERS OFFICE	NO
DEPARTMENT OF HIGHWAYS	
Photo Unit	NO
Travel Promotions	NO
DEPARTMENT OF JUSTICE	
Fire Marshal	NO
Criminal Investigation Bureau	NO
Board of Crime Control	NO

QUESTION	ANSWER
IF YES, HOW OFTEN 16mm WORK?	
FISH AND GAME — Film Center	ANNUALLY
HEALTH AND ENV. SCIENCES — Solid Waste Mngt. Bureau	ANNUALLY
IF YES, FOR WHAT TYPE OF PROJECT?	
FISH AND GAME — Film Center	FOR TELEVISION AND PUBLIC SHOWINGS
HEALTH AND ENV. SCIENCES — Solid Waste Mngt. Bureau	FOR TELEVISION AND PUBLIC MEETINGS
DO YOU HAVE A FILMMAKER ON STAFF?	
FISH AND GAME — Film Center	YES
HEALTH AND ENV. SCIENCES — Solid Waste Mngt. Bureau	NO
DO YOU CONTRACT 16mm WORK?	
FISH AND GAME — Film Center	NO
HEALTH AND ENV. SCIENCES — Solid Waste Mngt. Bureau	YES
HOW OFTEN 16mm CONTRACTED, AND FOR WHAT TYPE WORK?	
HEALTH AND ENV. SCIENCES — Solid Waste Mngt. Bureau	ONE ANNUALLY

ATTACHMENT E

PART VII

APPENDIX 1-C: DESCRIPTIONS OF AGENCIES COVERED IN-DEPTH

Department of Social Rehabilitation
Services
Training Rehabilitation Information Center
Ted Spas

The Training Rehabilitation Information Center, TRIC, has been serving Social Rehabilitation Services for several years. As the successor to the Developmentaly Disabled Training Institute, TRIC inherited a black & white production system with reel-to-reel editing and 3/4 inch record/playback ability. TRIC produces one B & W training tape quarterly and distributes the product to the five regional offices of SRS's Developmental Disabilities Division: each divisional office has a Sony Rover with Monitor system.

Over the years, TRIC has established a reciprocal relationship with the Office of Public Instruction's Library Media component. The center duplicates and distributes training tapes in ½ and 3/4 inch formats; duplication activities are extensive.

Besides responsibilities for video, the three staff members of the Center distribute film and hard copy software.

The B & W system at TRIC is a coherent 2 camera switchable system. The Center has a B & W vertical interval switcher with monitors mounted in a portable cabinet.

Department of Fish & Game
Film Production Unit
Mike Gurnett

As described earlier in the report, Fish & Game has a substantial 16mm effort. Presently, the production unit is finishing one 28 min. film and planning another. With limited staff, production emphasis is being placed on Public Service Announcements.

Knowledge of how to use a 16mm camera is not localized in the production unit; other Fish and Game personnel use the cameras to document field work, collect footage on wildlife and shoot file footage for inclusion in future documentaries and training films.

In 1980, Fish & Game Saftey & Training Bureau considered acquiring a video field unit with editing; however, other priorities prevented any purchases being made. An interest still remains to acquire video for taping field work and producing hunter saftey public education programs.

Department of Institutions
Programing Services Division
John Thomas

Sub units within the Department of Institutions use television as a therapy tool with clients in programs and hospitals. A preference seems to exist for pre-produced software rather than in-service production of training materials. On occasion, a training program will be contracted, the most recent under discussion, one to be produced by the production unit of MSU.

For the most part, the equipment used in the department is B & W; however, given its purposes, this type of utilization does not argue for sophisticated color systems and, given the cinema verite qualities of B & W, a non color use might be preferred in therapy situations.

Department of Justice
Highway Patrol
Bill Erwin & Robert Fears

The Highway Patrol is in the process of detailing specifications for a modest ½inch cassette in-house production-field training system. The Patrol is aware that personnel costs and travel expenses are reaching a point where television can offer cost effeciencies. The system will involve in-house production with some field work--the finished product to be bicycled to Highway Patrol training centers.

Television production would be used in recruiting programs, employee orientation, First Responder Programs and bicycling explanations of new reporting proceedures, etc. The Patrol favors the Beta format.

Department of Conservation
Natural Resources
Information Officers
Jim Bond & Tom Livers

The Energy Divison of DNRC manages Montana's Alternate Renewable Energy Progam in it Renewable Energy Bureau. The Renewable Energy Program was five years old in 1980; at that time, the "RE" Bureau concluded that Montana citizens were not as well informed as they could be about the program and what it offered. In order to better inform the public about the scope and accomplishments of the program, the Bureau arranged for the production of two 30 minute video programs for possible airing on Montana stations: this project allowed the agency to acquire the 3/4 inch editors.

The experience gained for these two experimental programs has led the Bureau to plan television which emphasizes programing for public meetings, fairs, public service announcements, etc.

While the pilot project allowed acquiring editors, no field 3/4 inch system was purchased. The agency has expressed interest in trading access to a compatable field system for access to their editors.

The Land Use Planning Division of DNRC is responsible for writing environmental impact statements for Montana's energy projects. The Divison uses television recording and playback for remote sensing, using a video digitizing device which density slices infra-red spectral and thermal information. Besides this specialized application, the Divison has an interest in developing some level of in-house expertise to produce segments of environmental impact statements--issues, analysis of data, etc.-- as a tool for facilitating public comment at public meetings.

Department of Health & Environmental
Sciences
Planning & Evaluation Unit
Robert Solomon

The Planning & Evaluation Unit manages an information library for the agency and city/county program participants, lending film, hardcopy and television software. The library produces in B & W, does duplicate 3/4 to 3/4 on a fairly frequent basis.

The Solid Waste Management Bureau has produced in-house training tapes, but has not been satisfied with quality. There is a recognition that untrained equipment operators have their limits.

Many hardware items acquired by the library have use limitations placed on them by the federal granting agencies; these limitations sometimes prevent multiple use of equipment and lending. Perforce, such federal policies hamper planning integrated systems.

PUBLIC TELEVISION TASK FORCE

MEMBERSHIP OPINION SURVEY

Responses = 10

1) [5] YES [5] NO DO YOU PRESENTLY RECEIVE PUBLIC TV (PTV)?

2) [4] YES [1] NO IF NOT, ARE YOU SERVING ON THE PTV TASK FORCE TO HELP ACQUIRE PTV?

3) WHICH OF THE FOLLOWING STATEMENTS BEST DESCRIBE YOUR PARTICIPATION ON THE PTV TASK FORCE?

a. [5] I WISH TO LEND MY SUPPORT TO THE GENERAL PROMOTION OF PTV IN MONTANA, BUT HAVE NO SPECIFIC IDEAS ON THE SUBJECT.

b. [0] I AM AN OPPONENT OF PTV.

c. [3] I WOULD LIKE TO SEE "FREE" PTV AVAILABLE STATEWIDE, REGARDLESS OF WHERE THE PROGRAMMING ORIGINATES, AND REGARDLESS OF HOW THE SIGNAL IS DISTRIBUTED.

d. [8] I WOULD LIKE TO SEE MONTANA DEVELOP ITS OWN PTV SYSTEM AND PROGRAM PRODUCTION CAPABILITY.

e. [2] I BELIEVE THE PROVISION OF PTV IS MORE IMPORTANT THAN WHO PROVIDES THE SIGNAL OR WHETHER SUBSCRIPTION FEES ARE CHARGED.

f. [1] I THINK I'M AN OBJECTIVE NEUTRAL ON THE PTV QUESTION, BUT INTERESTED IN LEARNING WHAT THE ISSUES AND POSSIBLE SOLUTIONS MIGHT BE.

4.) [9] YES [0] NO MONTANANS SHOULD BE ABLE TO RECEIVE "FREE" PTV.

[1] NO OPINION

5. PLEASE SELECT ONE FACTOR FROM EACH COLUMN TO INDICATE YOUR PREFERENCES.

PTV FUNDING SHOULD BE PROVIDED BY:		SIGNAL DISTRIBUTION:		PTV PROGRAMMING SHOULD BE PROVIDED BY:
. Federal Gov't.	2	b.1. Broadcast (high/low power)	2	c.1. Directly by U.S. Public Broadcasting Service
. State Gov't.	1	b.2. Microwave & cable	5	c.2. Montana's colleges/ universities
. Fed'l-State Gov't.	3	b.3. Satellite dish & cable	4	c.3. Separate Mt. PBS Corp.
4. TV(tax) districts	2	b.4. Direct satellite reception	2	c.4. Out-of-state PBS affiliates (i.e., KUED,KSPS)
. TV dist. & state		b.5. ________		c.5. ________
. TV dist. & Fed'l/State				
. Commercial subscriptions				
. Donations				
. ________				

) 10 YES 0 NO IF MONTANA DOES NOT HAVE ITS OWN PUBLIC TELEVISION SERVICE,

0 NO OPINION IT IS IMPORTANT THAT ARRANGEMENTS BE MADE TO PERMIT INSERTION OF MONTANA ORIGINATED PROGRAMMING, IF AT ALL POSSIBLE.

) IF MONTANANS ARE TAXED OR COMMERCIALLY CHARGED FOR PTV SERVICE THE MONTHLY AVERAGE CHARGES SHOULD NOT EXCEED:

a. 4 $5

b. 1 $10

c. 1 $15

d. 0 $20

e. 0 $25

f. 0 $30

g. 4 Whatever market will bear

8) [9] YES [0] NO IT IS IMPORTANT THAT MONTANA HAVE ITS OWN PROGRAM
[1] NO OPINION PRODUCTION CAPABILITY.

9) IF MONTANA WERE TO HAVE PROGRAM PRODUCTION CAPABILITY, OR IF THAT CAPABILITY WERE TO BE REDIRECTED, I BELIEVE ANY PUBLIC FUNDS SHOULD BE USED TO PROMOTE: (First choice #1, second #2, etc.)

[3] a. CENTRALIZED PRODUCTION CENTER, UNIVERSITY SYSTEM RELATED

[2] b. CENTRALIZED PRODUCTION CENTER, UNIVERSITY AND VO-TECH RELATED

[1] c. CENTRALIZED PRODUCTION CENTER, INDEPENDENT OF EXISTING INSTITUTIONS

[4] d. DECENTRALIZED PRODUCTION CENTER, UNIVERSITY AND/OR VO-TECH RELATED

[5] e. DECENTRALIZED PRODUCTION CENTER, COMMUNITY BASED/REGIONALLY BASED

COMMENTS:____

.) [6] YES [1] NO IF THE EVIDENCE INDICATES THAT PTV IS AN EVENTUALITY IN
[2] NO OPINION MONTANA WITHIN THE NEXT FIVE TO TEN YEARS - DUE TO CHANGES TAKING PLACE IN THE TELECOMMUNICATIONS INDUSTRY - EVEN IF NO STATE PUBLIC FUNDS ARE SPENT - ANY DECISION TO SPEND SUCH FUNDS SHOULD BE APPROACHED WITH UTMOST CAUTION.

.) PLEASE ADD ANY COMMENTS OR OPINIONS NOT ADDRESSED TO YOUR SATISFACTION.

MEMBERSHIP LIST
PUBLIC TELEVISION & VIDEO TASK FORCE ATTACHMENT G

Alden E. Clifford III, Montana Telecommunications Project Administrator

Include all MTAC members on mailing list.

Bond, Jim
Information Officer
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32 So. Ewing
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Cutbank 59427

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Flaningam, Rita, Ph.D
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Gouth, Dick
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368-2247

Matson, John H.
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White Sulphur Springs 59645
547-37[illegible]

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Missoula 59801

Moore, Jim no
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Box 970
Red Lodge 59068
446-2222

Nelson, David
Montana Arts Council
1280 So. 3rd St. W.
Missoula 59801
243-4883

Robertson, Thomas R.
801 First St. East
Roundup 59072

Stollard, Bill E., President
Stollard Broadcasting, Inc.
P.O. Box 317
Plentywood 59254

Thomas, Douglas H.
610 Stuart St.
Helena 59601
442-8717

Toole, Ken
715 Front St. (H) 599 W. Main
Helena 59601 Helena 59601
(O) 449-3044
(H) 442-3880

est, Paul
/o The West Branch
.O. Box 2802
orris 59745

idget, Dr. Lawrence A.
sst. Prof. of Library-Media
niversity of Montana
issoula 59812
: 243-2853
: 549-3609

ilkison, Wade, Exec. Dirc.
ISCA
Low Income Senior Citizens Advocates)
.O. Box 897
elena 59601

indy Boy, Sam
ocky Boy Route
ox Elder 59526
95-4478

isocki, Mike
t. Inst. for High Tech. Appli.
52 First Federal Building
issoula 59807
29-3772

ATTACHMENT H

PUBLIC TELEVISION AND RADIO SURVEY

HELLO, MY NAME IS ________________________________. I'M TAKING A PUBLIC OPINION SURVEY ON PUBLIC ATTITUDES TOWARD PUBLIC RADIO AND PUBLIC TV IN MONTANA. YOUR TELEPHONE NUMBER HAS BEEN RANDOMLY SELECTED BY MACHINE, AND THE SURVEY WILL TAKE ABOUT 5 MINUTES. WE DO NOT KNOW YOUR NAME OR ADDRESS AND YOU WILL NOT BE PUT ON A MAILING LIST OR ANYTHING LIKE THAT. WOULD YOU MIND ANSWERING SOME QUESIONS? (THANK YOU)

> IF ASKED WHO YOU REPRESENT EXPLAIN THAT YOU WILL TELL THEM AFTER THE INTERVIEW SO THEIR ANSWERS WILL NOT BE INADVERTENTLY BIASED.
>
> TERMINATE IF THEY INSIST ON KNOWING WHO YOU REPRESENT NOW.

I. ARE YOU 18 YEARS OF AGE OR OLDER?

a. NO → TERMINATE

b. YES → PROCEED

II. DO YOU HAVE AT LEAST ONE OPERATING TV?

a. NO → GO TO V

b. YES → PROCEED

III. ABOUT HOW MANY HOURS PER WEEK IS YOUR TV ON AND BEING WATCHED BY AT LEAST ONE PERSON IN YOUR FAMILY?

a.______1-5	e.______21-25
b.______6-10	f.______26-35
c.______11-15	g.______36-45
d.______16-20	h.______45+

IV. DO YOU PRESENTLY RECEIVE PUBLIC BROADCASTING SYSTEM OR EDUCATIONAL TV FROM ANY SOURCE?

A. NO → GO TO [IF NO]

B. YES

[IF YES]

1. DO YOU RECEIVE PBS BY

   A._______TRANSLATOR

   B._______CABLE

   C._______DIRECT BROADCAST

   D._______SATELLITE

   E._______OTHER

2. IS THE PBS PROGRAMMING YOU RECEIVE

   A. SATISFACTORY

   B. UNSATISFACTORY

3. DO YOU PAY FOR THE PBS SERVICE YOU RECEIVE?

   A. NO

   B. YES

   [IF YES]

   (1) WHAT IS THE COST OF YOUR PBS SERVICE

   (a) ___$10 or LESS

   (b) ___$11 - $20

   (c) ___$21 - $30

   (d) ___$31 or MORE

   (2) DO YOU MAKE AN ADDITIONAL DONATION TO THE PBS STATION OVER AND ABOVE THAT?

   (a) ____NO

   (b) ____YES

   [IF NO]

   (3) DO YOU MAKE A VOLUNTARY DONATION IN SUPPORT OF THE PBS STATION YOU RECEIVE?

   (a) ____NO

   (b) ____YES

   [IF YES] (i) DO YOU DONATE

   a. $100 or LESS
   b. $101 - 200
   c. $201 - 300
   d. $301 - 400
   e. $401 - 500
   f. $501 or MORE

4. WOULD YOU LIKE TO SEE PROGRAMMING ON YOUR PBS CHANNEL THAT DEALS WITH MONTANA SUBJECT MATTER?

A. ___NO → PROCEED TO V

B. ___YES → IF YES

TO V

(1) WHAT KIND OF MONTANA PROGRAMS WOULD YOU LIKE? I WILL LIST KINDS OF PROGRAMS - PLEASE SAY YES OR NO TO EACH.

PROCEED TO V

(a) ____PROFESSIONAL SPORTS

(b) ____COLLEGE SPORTS

(c) ____HIGH SCHOOL SPORTS

(d) ____ARTS & THEATRE

(e) ____OUTDOOR & RECREATIONAL

(f) ____STATE ISSUES AND POLITICS

(g) ____LOCAL ISSUES AND POLITICS

(h) ____MONTANA LEGISLATURE

(i) ____MONTANA HISTORY & CULTURE

(j) ____ARE THERE OTHERS I'VE MISSED?____________________

IF NO

5. IS PBS TV AVAILABLE TO YOU IF YOU WERE WILLING TO PAY FOR IT?

A. ____NO → PROCEED TO IF NO

B. ____YES → IF YES

TO IF NO

(1) WHICH OF THE FOLLOWING REASONS APPLY TO YOUR DECISION NOT TO PAY FOR PBS SERVICES?

(a) ____TOO EXPENSIVE?

(b) ____COMMERCIAL TV PROGRAMMING IS SUFFICIENT

(c) ____PBS PROGRAMMING ISN'T INTERESTING

(d) ____NO MONTANA PROGRAMMING

(e) ____NO CHILDREN TO BENEFIT

(f) _____POOR QUALITY RECEPTION

(g) ____OTHER

(2) WOULD YOU SUBSCRIBE TO PBS IF IT HAD MONTANA PROGRAMS?

(a) NO — PROCEED TO V

(b) YES

IF YES

TO ⚠

(A) WHAT KIND OF MONTANA PROGRAMS WOULD YOU LIKE? I WILL LIST KINDS OF PROGRAMMING--PLEASE SAY YES OR NO TO EACH.

PROCEED TO V

(a1) _____PROFESSIONAL SPORTS

(a2) _____COLLEGE SPORTS

(a3) _____HIGH SCHOOL SPORTS

(a4) _____ARTS & THEATRE

(a5) _____OUTDOOR & RECREATIONAL

(a6) _____STATE ISSUES AND POLITICS

(a7) _____LOCAL ISSUES AND POLITICS

(a8) _____MONTANA LEGISLATURE

(a9) _____MONTANA HISTORY AND CULTURE

(a10) _____ARE THERE OTHERS I'VE MISSED?

(Specify)____

IF NO

6. WOULD YOU LIKE TO BE ABLE TO RECEIVE A PBS OR EDUCATIONAL TV CHANNEL?

(A) _____NO

(B) _____YES

(1) WHAT IS THE MAXIMUM MONTHLY AMOUNT YOU WOULD PERSONALLY BE WILLING TO SPEND EACH YEAR TO RECEIVE PBS IF YOU WERE CHARGED DIRECTLY FOR THE SERVICE?

(a) _____$10

(b) _____$1-$5

(c) _____$6-$7

(d) _____$8-$10

(e) _____$11-$13

(f) _____$14-$16

(g) _____$17-$19

(h) _____$20 or MORE

(2) WHICH OF THE FOLLOWING METHODS OF PROVIDING YOU WITH PBS DO YOU THINK IS BEST? I'LL LIST THE OPTIONS FIRST, THEN PLEASE INDICATE YOUR PREFERENCE.

(a) _____STATE GOVERNMENT FUNDING ONLY

(b) _____LOCAL TV DISTRICT FUNDING ONLY

(c) _____COMBINED STATE GOVERNMENT AND LOCAL TV DISTRICT FUNDING

(d) _____PERSONAL PURCHASE OF SATELLITE RECEPTION EQUIPMENT

(e) _____DONATIONS

(f) _____PRIVATE BUSINESS FUNDING ONLY -- EVEN IF THAT WOULD MEAN NO SERVICE DUE TO UNPROFITABILITY

V. PUBLIC RADIO IN MONTANA IS PROVIDED BY UNIVERSITIES, COLLEGES, AND VO-TECH SCHOOLS. THE TRANSMITTERS ARE VERY LOW POWER. FUNDING IS PRIMARILY PROVIDED BY THE STATE.

a. DO YOU HAVE AT LEAST ONE OPERATING RADIO IN YOUR HOME?

1. NO ——> TERMINATE IF NO TV - otherwise - GO TO VI

2. YES ——> PROCEED

b. ABOUT HOW MANY HOURS PER WEEK ARE YOUR HOME RADIOS BEING LISTENED TO BY AT LEAST ONE PERSON IN YOUR FAMILY?

1. _____1-5	5. _____21-25
2. _____6-10	6. _____26-35
3. _____11-15	7. _____36-45
4. _____16-20	8. _____45+

c. CAN YOU PRESENTLY RECEIVE PUBLIC RADIO?

1. _____NO - GO TO 8 (below)

2. _____DON'T KNOW

3. _____YES

d. IS THE PUBLIC RADIO PROGRAMMING YOU RECEIVE

1. _____SATISFACTORY

2. _____UNSATISFACTORY

3. _____NO OPINION

e. DO YOU DONATE MONEY TO YOUR PUBLIC RADIO STATION?

1. _____NO

YES, APPROXIMATELY

2. _____$100 or Less

3. _____$101-200

4. _____$201-300

5. _____$301-400

6. _____$401-500

7. _____$501 or More

(2) WHICH OF THE FOLLOWING METHODS OF PROVIDING YOU WITH PBS DO YOU THINK IS BEST? I'LL LIST THE OPTIONS FIRST, THEN PLEASE INDICATE YOUR PREFERENCE.

(a) _____STATE GOVERNMENT FUNDING ONLY

(b) _____LOCAL TV DISTRICT FUNDING ONLY

(c) _____COMBINED STATE GOVERNMENT AND LOCAL TV DISTRICT FUNDING

(d) _____PERSONAL PURCHASE OF SATELLITE RECEPTION EQUIPMENT

(e) _____DONATIONS

(f) _____PRIVATE BUSINESS FUNDING ONLY -- EVEN IF THAT WOULD MEAN NO SERVICE DUE TO UNPROFITABILITY

V. PUBLIC RADIO IN MONTANA IS PROVIDED BY UNIVERSITIES, COLLEGES, AND VO-TECH SCHOOLS. THE TRANSMITTERS ARE VERY LOW POWER. FUNDING IS PRIMARILY PROVIDED BY THE STATE.

a. DO YOU HAVE AT LEAST ONE OPERATING RADIO IN YOUR HOME?

1. NO ⟶ TERMINATE IF NO TV - otherwise - GO TO VI

2. YES ⟶ PROCEED

b. ABOUT HOW MANY HOURS PER WEEK ARE YOUR HOME RADIOS BEING LISTENED TO BY AT LEAST ONE PERSON IN YOUR FAMILY?

1. _____1-5	5. _____21-25
2. _____6-10	6. _____26-35
3. _____11-15	7. _____36-45
4. _____16-20	8. _____45+

c. CAN YOU PRESENTLY RECEIVE PUBLIC RADIO?

1. _____NO - GO TO 8 (below)

2. _____DON'T KNOW

3. _____YES

d. IS THE PUBLIC RADIO PROGRAMMING YOU RECEIVE

1. _____SATISFACTORY

2. _____UNSATISFACTORY

3. _____NO OPINION

e. DO YOU DONATE MONEY TO YOUR PUBLIC RADIO STATION?

1. _____NO

YES, APPROXIMATELY

2. _____$100 or Less

3. _____$101-200

4. _____$201-300

5. _____$301-400

6. _____$401-500

7. _____$501 or More

f. WOULD YOU LIKE TO RECEIVE:

1. _____MORE MONTANA ORIGINATED PROGRAMMING?
2. _____MORE NATIONAL PROGRAMMING?
3. _____THE PROGRAMMING NOW AVAILABLE?
4. _____DON'T KNOW.

g. REGARDLESS OF YOUR PREFERENCE FOR MORE MONTANA OR NATIONAL PROGRAMMING, WHAT KINDS OF PROGRAMS WOULD YOU LIKE MORE OF? I WILL LIST KINDS OF PROGRAMS -- PLEASE SAY YES OR NO TO EACH.

1. _____PROFESSIONAL SPORTS
2. _____COLLEGE SPORTS
3. _____HIGH SCHOOL SPORTS
4. _____RADIO THEATRE
5. _____OUTDOOR AND RECREATIONAL
6. _____STATE ISSUES AND POLITICS
7. _____LOCAL ISSUES AND POLITICS
8. _____MONTANA LEGISLATURE
9. _____MONTANA HISTORY AND CULTURE
10. _____NO OPINION
11. _____OTHER (specify) _______________

h. WHICH MEANS OF FUNDING PUBLIC RADIO DO YOU THINK IS BEST? I'LL LIST THE OPTIONS FIRST, THEN PLEASE INDICATE YOUR CHOICE.

1. _____STATE GOVERNMENT FUNDING ONLY
2. _____LOCAL TV DISTRICT FUNDING ONLY
3. _____COMBINED STATE-LOCAL TV DISTRICT FUNDING
4. _____FEDERAL FUNDING, TO THE EXTENT POSSIBLE
5. _____NO FUNDING

i. EACH OF THE PUBLIC RADIO STATIONS IS INDEPENDENTLY FUNDED AND OPERATED. IN YOUR OPINION, SHOULD THE VARIOUS STATIONS BE MADE INTO A NETWORK?

1. _____NO
2. _____YES   3. _____NO OPINION

j. SHOULD THE PRESENT LOW POWER RADIO STATIONS INCREASE THEIR OUTPUT IN ORDER TO COVER ALL OF MONTANA?

1. _____NO
2. _____YES   3. _____NO OPINION

k. IN YOUR OPINION, IS PUBLIC RADIO IN MONTANA DESERVING OF SIGNIFICANTLY GREATER FINANCIAL SUPPORT THAN IT PRESENTLY RECEIVES?

1. _____NO
2. _____YES
3. _____NO OPINION

a. ______________________________
WHAT TOWN OR CITY DO YOU LIVE IN?

b. ________(CHECK IF LIVE NEAR ABOVE TOWN, BUT NOT IN IT).

c. ______________________________
WHAT COUNTY DO YOU LIVE IN?

d. WHAT IS YOUR AGE?

1. _____18-25
2. _____26-35
3. _____36-45
4. _____46-55
5. _____56-65
6. _____66 or MORE

e. EDUCATION:

1. _____8th or LESS
2. _____SOME HIGH SCHOOL
3. _____HIGH SCHOOL GRADUATE
4. _____SOME COLLEGE
5. _____COLLEGE GRADUATE

f. HOW MANY CHILDREN DO YOU HAVE AT HOME AND HOW OLD ARE THEY?

NO AGE

1._____ 0
2._____ 1 _____
3._____ 2 _____ _____
4._____ 3 _____ _____ _____
5._____ 4 _____ _____ _____ _____
6._____ 5 _____ _____ _____ _____ _____
7._____ 6 _____ _____ _____ _____ _____ _____
8._____ MORE THAN SIX (NO AGES NECESSARY)

g. WHICH AREA DOES YOUR TOTAL FAMILY INCOME FALL INTO?

1. _____$15,000 or LESS
2. _____$15,001 to $25,000
3. _____$25,001 to $35,000
4. _____$35,001 to $45,000
5. _____$45,001 or MORE

I WOULD LIKE TO THANK YOU FOR YOUR TIME AND COOPERATION. THIS SURVEY IS BEING CONDUCTED BY THE MONTANA TELECOMMUNICATIONS PROJECT, WHICH IS ATTACHED TO THE MONTANA DEPARTMENT OF ADMINISTRATION. THANK YOU AGAIN FOR YOUR HELP. GOOD NITE!

PUBLIC RADIO & TV SURVEY

RESPONSE TALLY

I. a b
II. a b
III. a b c d e f g h
IV. a
IF YES b: 1: A B C D E
2: A B
3: A
B: (1): (a) (b) (c) (d)
(2): (a) (b)
(3): (a)
(b): (A) (B) (C) (D) (E) (F)
4: A
B: (1): (a) (b) (c) (d) (e) (f) (g) (h) (i) (j)
IF NO 5: A
B: (1): (a) (b) (c) (d) (e) (f) (g)
(2): (a)
(b) (A) (a1) (a2) (a3) (a4) (a5) (a6) (a7) (a8) (a9) (a10)
6: A
B: (1): (a) (b) (c) (d) (e) (f) (g) (h)
(2): (a) (b) (c) (d) (e) (f)

V. a: 1 2
b: 1 2 3 4 5 6 7 8
c: 1 2 3
d: 1 2 3
e: 1 2 3 4 5 6 7
f: 1 2 3 4
g: 1 2 3 4 5 6 7 8 9 10 11 circle "yes" only
h: 1 2 3 4 5
i: 1 2 3
k: 1 2 3

VI. a: ____________________
b: ____________________
c:
d: 1 2 3 4 5 6
e: 1 2 3 4 5

Age
f: 1. 0 ☐
2. ____/____
3. ____/____ ____
4. ____/____ ____ ____
5. ____/____ ____ ____ ____
6. ____/____ ____ ____ ____ ____
7. ____/____ ____ ____ ____ ____ ____
8. ☐
g: 1 2 3 4 5

SUMMARY OF RESULTS OF
PUBLIC TELEVISION AND RADIO SURVEY

Prepared for
Telecommunications Project Staff
Department of Administration
State of Montana

by
Rita Rice Flaningam, PhD
Montana State University
July 1981

One aspect of the Telecommunications Project was a survey of public attitudes about public radio and television within the state of Montana. It was assumed that information gathered in such a survey would serve three functions: (1) help planners assess public understanding of the issues and technologies associated with the Project, (2) define the nature of access the public has to extant systems providing public broadcasting within the state, and (3) assess the public's desire for such programming including methods of delivery, payment options and preferred program content.

To obtain the desired information a telephone survey and questionnaire were designed by members of the project staff. Through the use of telephone company data nearly 1400 potential respondents to the questionnaire were randomly selected using available computer hardware and software. During early May interviewers employed by the Project called the selected individuals, indicated they were taking a public opinion survey on attitudes toward public radio and television in Montana, and invited them to participate. Those individuals who insisted on knowing more about who was conducting the survey were thanked for their time and the interview was terminated. (This was done to insure that people were not responding in terms of information they had about

the Telecommunications Project.) The same practice was employed for individuals who indicated they were under 18 years of age as the survey director hoped to eliminate inaccurate answers.

Of the nearly 1400 individuals surveyed, 1296 gave responses complete enough to be analyzed. According to the demographic information provided by respondants, the survey team sampled a slightly atypical segment of the Montana population. (This generalization may be invalid as many people simply did not give certain information to the interviewers.)

Generally speaking the population sampled had the following characteristics:

(1) 87% lived in towns or cities
(based on a response n of 809)

(2) 12% were aged 18 - 25
22% were aged 26 - 35
21% were aged 36 - 45
20% were aged 46 - 55
17% were aged 56 - 65
63% were 66 or older
(based on a response n of 694)

(3) 23% completed 8th grade or less
29% completed some high school
18% were high school graduates

17% had some college

13% were college graduates

(based on a response n of 782)

(4) 52% had incomes of $15,000 or less

30% had incomes of $15,001 - $25,000

11% had incomes of $25,001 - $35,000

39% had incomes of $35,001 - $45,000

39% had incomes of $45,001 or more

(based on a response n of 1146)

The variation in the amount of information individuals were willing to give about their age, education, income and family size mitigated against analysis of responses of individuals in specific socio-economic categories.

A summary of the responses of the 1296 citizens follows.

Attitudes About Public Television Programming

Those persons owning at least one operating television receiver were questioned about their viewing habits and their access to public television programming.

859 individuals gave information about the number of hours per week television was viewed by at least one member of the family. On the basis of their responses we found that the greatest percentage of households (2190) were watching television 26-35 hours per week. 16% reported

viewing over 45 hours per week and 61% of the households reported watching television over 20 hours per week.

These same individuals were questioned with regard to their access to public broadcasting/educational TV, the desirability of such options and aspects of transmitting and funding such options. 520 individuals indicated they had access to such options.

When questioned as to how they received their programming 85% of the respondents were able to identify a mechanism. The overwhelmingly popular method of reception was cable which brought programming to 96% of those homes able to identify their programming source. Translators represented .06% and direct broadcast and satellite each accounted for .01% of the service.

Almost all of the individuals (92%) receiving PBS programming found it satisfactory. We are unable to determine whether this response included aspects of service and carrier qualities as well as programming content.

84% of those receiving public television programming pay for the service. When questioned about that cost, those who knew reported the following about their monthly cost:

78% pay $10 or less

20% pay $11 - $20

19% pay \$21 - \$30

19% pay \$31 or more

A total of 40 people (15%) reported making additional donations to the PBS station beyond their monthly charges. 33 individuals who do not pay for their public television programming made voluntary donations to PBS stations - 29 (88%) made donations of \$100 or less.

When asked whether they would like to see PBS programming that deals with Montana subject matter 63% of those individuals receiving public television said yes. Their preferences (in descending order) for programming are:

(1) Local Issues and Politics

(2) Montana History and Culture

(3) Outdoor and Recreational

(4) Arts and Theatre

(5) State Issues and Politics

(6) Montana Legislature

(7) Professional Sports

(8) College Sports

(9) High School Sports

(10) Religious Programs

Those individuals without public television in their homes were not particularly interested in having it. (Only 24% indicated a desire for it.) Reasons these individuals

gave for not having such service were (in descending order):

(1) PBS programming isn't interesting

(2) No children to benefit

(3) No Montana programming

(4) Poor quality reception

(5) Commercial TV is sufficient

(6) Too expensive

It is interesting to note that only 9% considered PBS too expensive.

These same people were asked if the availability of Montana programming would induce them to subscribe - 93% said yes. Their preferences for programming were:

(1) Montana History and Culture

(2) Outdoor and Recreational

(3) State Issues and Politics

(4) Montana Legislature

(5) Arts and Theatre

(6) Local Issues and Politics

(7) College Sports

(8) Professional Sports

(9) High School Sports

Those people who would like to be able to receive PBS (n = 307) were queried as to how much they would pay for it. 72% indicated they would be willing to pay $10 or less.

These people were also asked their opinions on the role of public funding of PBS. Over one-third favored combined state government and local TV district funding. In descending order their choices were:

(1) Combined state government and local TV district funding (37%)

(2) Private business funding only (19%)

(3) Local TV district funding only (16%)

(4) Personal purchase of satellite reception equipment (11%)

(5) Donations (9%)

(6) State Government funding only (8%)

Attitudes About Public Radio Programming

858 individuals (66%) reported having at least one operating radio in their home. Listening habits were examined and the largest group (24%) reported listening to the radio 1 - 5 hours per week. 21% reported listening 6 - 10 hours per week and 14% reported listening over 45 hours per week. (These data may reflect individual use of car receivers.)

One quarter of the subjects did not know whether they could receive public radio - 38% said they could, 37% said they could not. Those receiving public radio were generally pleased with its quality - 68% find it satisfactory. But only 7% donate money to a public radio station. Twenty-one

donate $100 or less, two donate $201 - $300 and one donates $401 - $500.

Listeners were questioned about the type of programming they prefer. When asked to indicate the types or programming they would like to receive they indicated:

(1) Programming now available

(2) Don't know

(3) More National Programming

(4) More Montana Originated Programming

Their preference for Montana Programming were:

(1) Montana History and Culture

(2) Local Issues and Politics

(3) Radio Theatre

(4) State Issues and Politics

(5) Montana Legislature

(6) Outdoor and Recreational

(7) High School Sports

(8) College Sports

(9) Professional Sports

(10) Religious Programming

All subjects were questioned about funding and delivery options for public radio. As with television the majority favored a combination of state-local district funding. Their choices in descending order were:

(1) Combined state-local district funding (47%)

(2) No funding (22%)

(3) Local district funding (11%)

(4) State funding only (10%)

(5) Federal funding (9%)

Interviewers explained to the subjects that public radio stations are independently funded and operated and asked whether they thought the various stations ought to be made into a network. Responses were evenly divided - 32% said yes, 37% said no and 31% had no opinion.

When asked whether low power radio stations should increase their output in order to cover all of Montana, 61% said yes, 27% said no and 12% had no opinion.

When asked whether public radio in Montana deserves significantly greater financial support than it presently receives, 49% said yes, 17% no and 34% had no opinion.

Some Conclusions

The data collected in the survey are most valuable and fulfill its intended functions. Although the preceding lists will be most valuable some generalizations may be made.

Individuals addressing potential programming options in

the State should find most useful the lists of individuals' preferences for programming types. Although Montana oriented programming was not the primary choice of consumers and potential consumers we do have a good list of program types that would probably attract a substantial audience.

A general lack of information and understanding about public media funding options and technologies seems to prevail. Areas in which the public must be better informed if they are to support telecommunications growth in the State are:

(1) What constitutes public programming as opposed to commercial programming,

(2) The nature and implications of various delivery technologies and options - e.g. satellite systems and networks,

(3) The nature and implications of various funding options - e.g. funding districts,

(4) The range of program content available on both public radio and television,

(5) The status of public radio and television in Montana - what is really available, and

(6) The potential for these media in the future and how that relates to them on an individual basis.

It is hoped that this information will be useful to Project planners and the survey team is to be congratulated on a job well done.

ATTACHMENT I

MONTANA PUBLIC TELEVISION SIGNAL DISTRIBUTION ALTERNATIVES

June, 1981

by

Dr. Daniel N. March

INTRODUCTION Montana may be interested in establishing a Public Broadcasting Television Station. The signal from this station will have to be delivered to the people of Montana if it is to be of value. Most other states have PBS stations and delivery systems such that most residents in their state can receive the siganl. However, problems of delivering the TV signal to the people of the other states has not been as big a problem for them as it is in Montana. Montana has both a sparce population, relatively, and a large area. Montana cannot use a signal distribution criteria like, "A good signal will be present at every residence in the state if the signal is transmitted at 100 kilowatts from each city in the state with at least 100,000 people residing therein". Other states have successfully used such criteria. Montana needs to consider various technically feasible methods to deliver a TV signal to specific locations (generally cities) throughout the state and then the distribution of the signal to individual residences.

The purpose of this report is to provide a technical description, advantages and disadvantages, and relative costs of (A) systems to deliver the TV signal long distances throughout the state and (B) systems to deliver the signal to the residents. The long distance delivery systems to be investigated, per contract are terrestrial microwave systems and satellite systems while the home delivery systems to be considered are cable, high powered transmitters, and low powered transmitters. A variety of options using each of these combinations will be considered.

TERRESTRIAL MICROWAVE TELEVISION SIGNAL DISTRIBUTION

Basic Definitions

Terrestrial microwave systems use radio transmitters, repeaters, and receivers that are all located on the earth and each station must be able to "see" the next station. The particular radio frequencies used, generally between 2 GHz and 14 GHz ($2x10^9$ to $14x10^9$ Hertz), travel only in straight lines unless they are reflected. Thus two microwave sites must be line-of-sight, optically visible to each other. Exceptions to this occur when a reflecting surface for the radio signal has been installed between the two sites. Then signals can be transmitted between the two sites via the reflecting surface. The reflecting surfaces often look like billboards. There are several present in Montana.

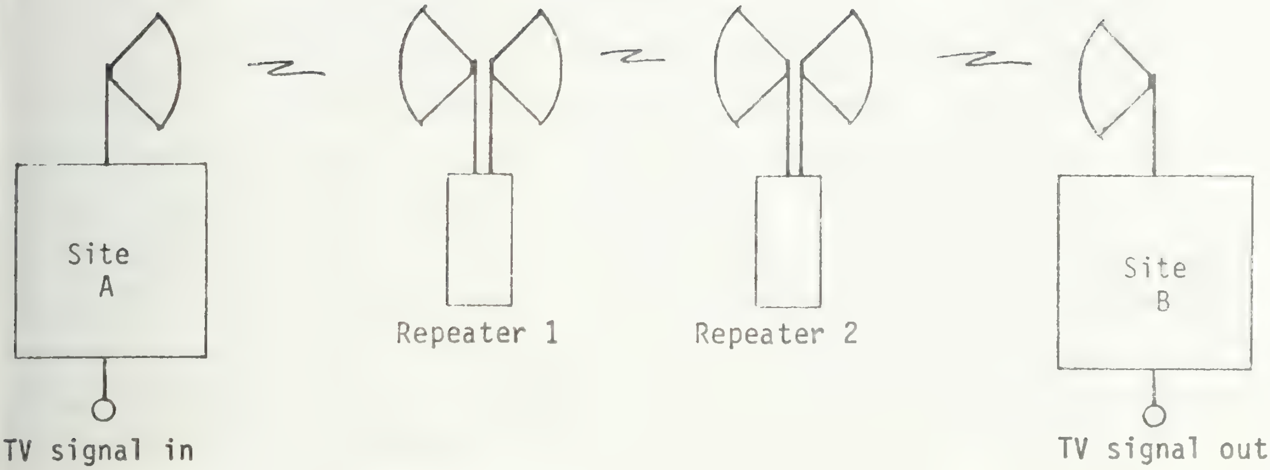

Figure 1. Block diagram of microwave communication link

Figure 1 shows a block diagram of a microwave communications link. Sites A and B are the terminals where signals may originate or terminate and there are two repeater sites. When the microwave link carries telephone communications, information must be able to travel in both directions. However, when TV signals are carried by a microwave system, the information signal need travel only in one direction. Assume a TV signal is present at site A and it is desired at site B. The TV signal, which is a low frequency signal relative to the microwave frequency, has to be translated in frequency to the microwave frequency. This translation is generally called modulation. The microwave signal will contain the TV signal either in changes in its amplitude or as changes in its frequency. The TV signal, when translated to the microwave frequency region, is no longer receivable on a standard TV receiver. However, a microwave receiver can translate the TV signal back to a frequency that can be received by a standard TV set. Thus, in figure 1 site A will have a TV signal input but its output will be the modulated microwave frequency. Repeater number 1 will receive the microwave frequency from site A and will translate the received microwave frequency a small amount and will then retransmit the new frequency signal to the next repeater. The slight

frequency change was required as a site should not receive and transmit on the same frequency because the receiver generally "hears" only its own transmitter in such cases. The microwave signal then propagates to repeater number 2 where it is again received, translated slightly in frequency, and retransmitted to site B. At site B the microwave signal is received, demodulated (translated in frequency to a desired TV channel) and is then available for further distribution. The output from the site B microwave station is in the form of a voltage on a coaxial cable . If a TV set were at the site the coaxial cable could be used as the signal source for the TV set and a picture with audio would be present. However, there is not necessarily a TV transmitter at the site nor cables to other receivers. The problem of getting the TV signal from the microwave site to residences is considered later in this report.

The distance apart that the repeaters can be spaced is a function of the microwave frequency used and the local terraine. The lower the microwave frequency that is used, the farther apart the repeaters can be because the microwave signal attenuation per mile increases as frequency increases. A 2 GHz microwave system can be expected to have repeaters spaced 30 to 35 miles apart while a 6 GHz system will need repeaters every 25 to 30 miles.

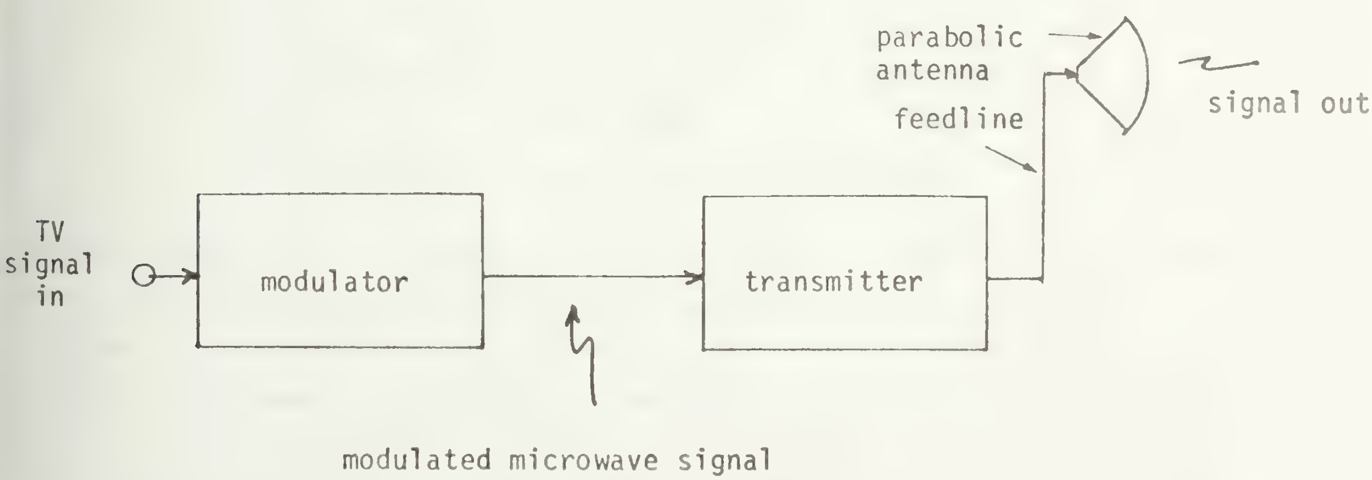

Figure 2. Block diagram of original transmitting terminal

Parabolic dish antennas are generally used for receiving and transmitting at microwave sites. The parabolic antenna focuses the microwave radio signal so that most of its energy goes in one direction. The results are much like that of a search light. In fact, the aircraft search lights used in the Second World War had parabolic reflectors. Figure 2 shows the block diagram of equipment needed at the terminal where a TV signal originates on a microwave system. The TV signal modulates a microwave signal in the modulator. This signal feeds the transmitter which amplifies the signal to the level to be transmitted. This signal in turn passes through a feed line, coaxial cable or waveguide, to the antenna. At the antenna the microwave signal is directed to the first receiving site.

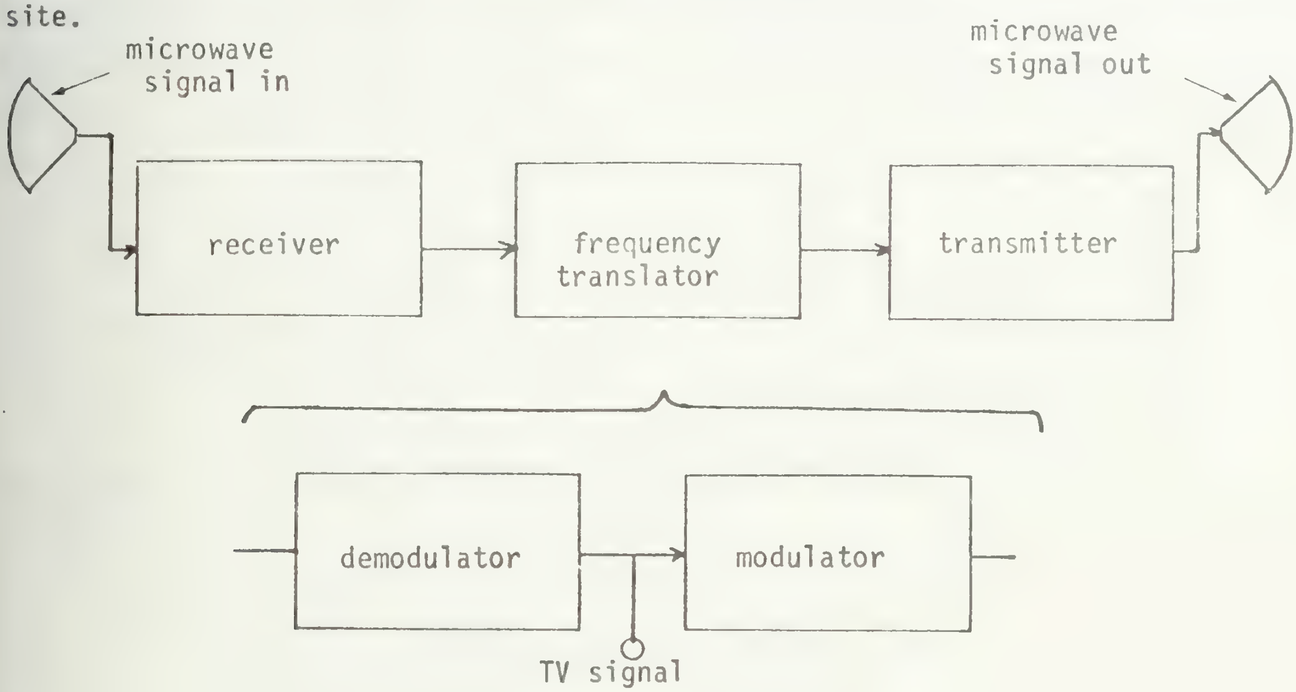

Figure 3. Repeater site block diagram

Figure 3 shows a block diagram of the equipment at a repeater site. The microwave signal is received by the antenna and passes through a feed line to the receiver. The signal out of the receiver can then be processed in either of two ways, as shown in the diagram. The signal can simple be translated in frequency and retransmitted. Some equipment manufacturers take the signal from the receiver and demodulate it so that the original TV signal is available. Then, in normal operation, the demodulated signal is used to modulate another microwave signal which in turn is transmitted. This process is also shown in figure 3. With this latter process there are several advantages. One advantage

is that the demodulated signal quality can be checked, like on a TV set. Also the demodulated signal may be used elsewhere at the site. For example a low powered television transmitter could be operated at the site. Finally, there is the possibility of adding control signals or monitor signals to the demodulated signal prior to remodulation. This allows a small amount of local information to be added to the microwave output of the site so that it could be observed at a nearby city that had a microwave terminal in it.

Figure 4 shows a block diagram of a receiving terminal. Such a site has no need to retransmit the signal. Generally such a terminal would be in a city or town or at a television transmitting site. The output of the microwave receiving terminal would be the TV signal, again in the form of a voltage at some output terminals.

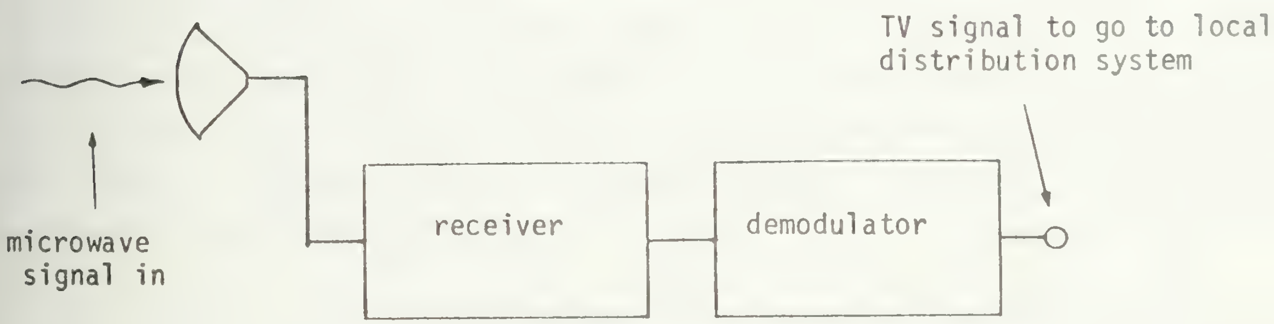

Figure 4. Block diagram of receiving terminal

SYSTEM DESIGN Now, the various types of microwave terminal sites and repeaters can be used in block diagram form to lay out communication systems. An example will be shown. In this example a microwave originating terminal is at a television studio. The studio will probably be receiving many national programs via microwave as most Montana TV stations presently do. The studio may also be getting signals from a satellite via an earth station. Then, too, some programs will have been prepared elsewhere and reproduced at the studio via video recording and some programs may originate at the studio. Events can also be presented

live from their locations not near the studio via temporary microwave paths between the event location and the studio. The signal from the studio is the signal that is to be delivered to various sites via microwave for distribution to residences. Microwave communication systems may be leaving the studio in more than one direction.

Figure 5 shows a segment of a microwave communication link with several options of system configuration. The studio is shown on the left hand side. Two microwave communication links are shown leaving the studio. One could be going east while the other goes west. There could be other microwave links leaving the studio. Not all of the microwave links necessarily have to have the same TV signal. For example, some programs that might be of significant interest to Western Montana might be of little interest to Eastern Montana and vice versa. With the microwave communication system, it is feasible to show different programs to different areas of the state. There can also be more than one studio present in the microwave system. One studio could be in Western Montana and one could be in Eastern Montana. If a two way microwave system were present between the two stations, part of the time both stations could use the same programs, part of the time they could both use seperate programs, and both could use programs originating at either terminal.

The microwave link leaving the studio on the right hand side would feed a series of repeaters. One or more of these repeaters could have the demodulated microwave signal, actually the TV signal available for a low powered TV transmitter. This unit, probably a 100 watt transmitter, would be unmanned and would provide a usable TV signal to some rural area. The microwave repeater site is likely to be at a high elevation and have electrical power present. The TV coverage from such a site can be significant. More details about low-powered TV transmitters will be presented later in this report.

Another microwave repeater is shown in figure 5 after the repeater with the unmanned low-powered TV transmitter. Then a repeater station is shown with two outputs, i.e. the signal is retransmitted toward the top of the page and also toward the botton of the page. The link toward the botton of the page terminates in a receiving terminal. At the receiving terminal, probably at or near a large

city, the TV signal is used to feed a cable TV system serving the community and it is used to feed a high powered transmitter which must be manned by a qualified person (FCC rules). The microwave link going toward the top of the page goes through several repeaters until a small community is reached. At the small community a repeater is used which has the TV signal available for use. The signal is used to feed a cable system for the community and a low powered unmanned TV transmitter is present. The microwave signal is shown continuing past this repeater site.

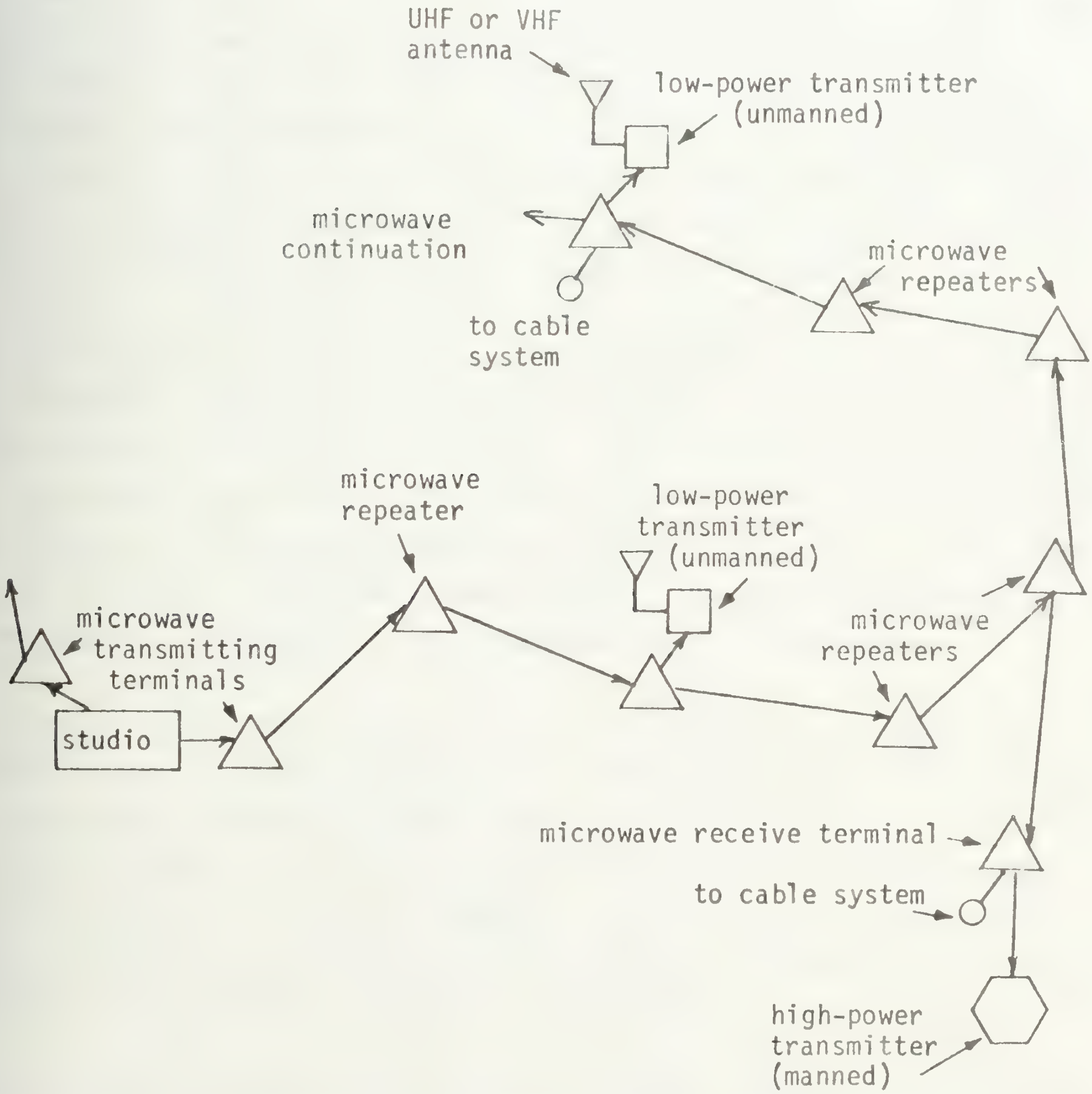

Figure 5. Block diagram of microwave system showing elements in possible lay-out.

A STATE OWNED MICROWAVE SYSTEM The State of Montana could design, build, and maintain a microwave system to transport the TV signal throughout Montana. The state could design its own system to serve exactly those sites it wanted. The quality of the TV signal should be broadcast quality (excellent) anywhere it is taken off the microwave system. Another factor to consider is that the state might want a microwave system for state use other than TV (i.e. voice communications, data transfer, facsimile, highway patrol dispatching, etc.). The need for such a system was investigated by McLeod and March[1] in 1973. The results of that investigation showed that, at the expected levels of state usage, GSA Telpak lines, communication channels which were available between various points and which were rented at reduced rates from the federal General Services Administration, were economically more feasible. The data that that decision was based upon may have changed significantly by 1981. Perhaps a re-evaluation in 1981, especially considering a PBS TV signal, would change the conclusions relative to a state owned microwave system. In this report pertinent details and costs relative to microwave communication systems to carry a TV signal will be given in general terms. A microwave system design to carry a TV signal throughout Montana is beyond the scope of this report and, in fact, a particular criteria to use for such a design is beyond the scope of this report. Examples of such criteria might be for the microwave signal carrying the TV signal to be delivered to each community with more than 4000 people in it (1980 census) or maybe the signal should be present in each county seat or maybe the signal should be delivered to only a few high powered TV transmitters.

A state owned microwave system to carry a TV signal will probably operate in the 6 GHz band due to Federal Communication Commission, FCC, rules and equipment availability. Repeaters in this band can be spaced 30 to 35 miles apart in friendly terraine but, a microwave system designer has told the author to plan on a 25 mile spacing for the distance between average repeaters. Then to transmit a TV signal, via microwave, between Helena and Bozeman, a distance of 107 miles, would probably require the two terminals and three repeaters.

The electronics for a standard repeater station, which will include antennas, tower, transmit and receive capabilities, and a simple building, will cost

approximately $50,000. The state would be expected to provide the site, a road and electrical power to the site, initial leveling of the site, and the concrete work for the building and antenna tower. If standby electrical power were desired at the site, the state would have to install equipment to provide it. Installation of the microwave equipment would be done by the manufacturer. The author has had recent experience with microwave sites in Montana. Site acquisition, road right-of-way, power line construction, and initial site excavation are costly and time consuming. Often times the cost of these latter considerations exceed the cost of the microwave equipment. However, on the average the site considerations should be less, especially in Eastern Montana. One way to reduce these site costs is to share sites with other microwave systems. There are other microwave systems in the state and at least some of them would be pleased to consider site sharing (personal phone conversations). Mountain States Bell, Montana Power, Pacific Power and Light, Western Microwave, Burlington Northern, and Bonneville Power are among the Montana microwave users.

If a TV signal is desired at a repeater site for transmission over a 100 watt transmitter, another $5000 worth of electronic equipment is needed in the microwave station. This does not include the cost of the transmitter or antenna. Microwave terminal equipment where the TV signal is originally put on a microwave system and transmitted to the first repeater or where the signal terminates, cost approximately $35,000 per site. Again this cost does not include site costs. These terminal sites are likely to be in cities or towns.

A microwave link, capable of carrying the TV signal, between Helena and Bozeman is going to cost at least 2x $35,000 plus 2x $50,000 or $170,000 for the electronic communication equipment only. A link between Great Falls and Havre will cost at least $220,000 for the communication equipment. Remember that these costs do not include land, leveling, concrete work, road, right-of-way, and electrical power. If already developed sites are available, then a cost sharing agreement must be negotiated with the site user. Such sharing of sites is considered almost essential these days (the good microwave sites are already used). Generally such agreements involve an initial payment by the new site occupant to the original developer of the site to share development costs. A continuing contract agreement is made relative to road and power line maintenance and some-

times even snow plowing or joint maintenance trips to the site are considered.

If the state of Montana were to have a microwave communication system of its own for telephone, data, dispatching and other uses, then a valid question is "How much more would the site electronics cost if a TV signal were carried on the microwave system?". The answer is not complicated if the original communication system is operating at 6 GHz. The incremental additional cost of equipment to carry the TV signal is then in the range of $11,000 to $15,000 per site. The microwave signal that carries the TV signal shares the same antennas as the other microwave signals.

As stated earlier, a statewide microwave system design for carrying the TV signal throughout the state is beyond the scope of this report. However, there is a microwave system layout for a 2 GHz voice and data system for Montana in the McLeod and March[1] report. This system map is shown in Appendix A. Every city with a population of at least 4000 is covered if a terminal is added for Livingston and Laurel is considered with Billings. The number of repeaters needed on the system if 6 GHz were used with average repeater spacing of approximately 25 miles is 53, with 12 terminals. This gives coverage to all locations shown on the map (dashed line as well as solid line). Note that terminals, like the one at Lewistown, require all the equipment of a repeater because a seperate transmitter and antenna is needed from the nearby repeater station as well as the antenna and receiver at the receiving terminal. Thus terminal and repeater stations are both assigned $50,000 for microwave communication equipment. Then the initial cost of the microwave equipment only is 3.25 million dollars. That cost does not include system design, site acquisition, roads, right-of-way, power lines, site preparation, nor maintenance.

Another consideration is, again, what if the state wanted a 6 GHz system to cover the locations on the map for voice and data, then what would be the additional costs to carry a TV signal. Using $11,000 per station the additional cost is $715,000 for added microwave equipment.

A final consideration of a state owned microwave system involves maintenance.

A rule-of-thumb in the microwave industry is that maintenance costs for the microwave system will be approximately ten percent of the new equipment costs. Thus, if the original system costs were $3,250,000, one could expect maintenance costs to be $325,000 annually. Maintenance costs in mountainous terraine tend to be more expensive. Equipment manufacturers have pointed out that maintenance costs for a system with both TV and voice, data, etc. are excessively high if the voice, data, etc. link is digital rather than analog. A digital link converts all signals to binary data for transmission. An analog system transmits the signals in analog form (continuous signal). TV transmission presently is in the analog form. For ease of maintenance, the other transmissions, if present, should also use analog transmission. Then, too, a spare parts inventory and maintenance test equipment must be purchased.

TELEVISION DISTRIBUTION VIA COMMON CARRIERS

Mountain Bell Microwave System

The telephone company has the most complete microwave system in the state of Montana. Their system generally does not now have the capability to carry a video signal but the equipment is available and can be installed. The phone company would like to distribute a PBS signal for Montana. Installation may take up to a year. The microwave system does not go to all towns in Montana. Mountain Bell Telephone would not plan to deliver the TV signal to communities that do not have microwave terminals. Montana sales poeple and engineers did not know how to indicate a price for TV signal delivery. Finally, American Telephone and Telegraph Long Lines out of New York City quoted prices which would be "very close".

The phone company would supply connections at sites for the TV signal. At a central studio connections might be available for the signal to go east and west. The state would pay a transmit or a receive loop charge each month if full time use were desired plus a station connection charge each month plus a mileage charge. The loop charge, which is the same for a transmitter or receiver, is $1051/mo./station and the station connection is $84.10/hour/location or $1577/month/location. The mileage charge between terminals is based on $0.79/airline mile/hour or $57.82/airline mile/month.

The phone company would also have a Maximum Termination Liability Charge (known as the MTL charge) which would be determined at the time of construction. The MTL is based on construction costs and is a charge a customer must pay only if he doesn't use the special facilities for a 10 year period. The MTL charge is reduced each month that the system is used by $1/120^{th}$. The MTL charge is of no consequence if the state uses the system for 10 years. If the state uses the system only 5 years, then half the MTL charge must be paid.

For comparitive purposes the approximate phone company charges for delivery of the TV signal to the locations shown on the map in Appendix A will be calculated. It is not known by the author whether the phone company has microwave facilities in each city or not.

The approximate total mileage involved in the communication system shown in Appendix A is approximately 1422 miles (assuming it is not necessary to tie the loop together). The mileage charge would then be $119,590.20 per month. The charges for 21 station loops would be $22,071/ month and the station connections would be $33,117/month. The total monthly bill then would be $174,778.20. The yearly charge, simply 12 times the monthly charge, would be $2,097,338.40. This amount certainly was not determined in an effort to find a minimum distance route. All distances were measured off a Montana map. The yearly charge calculated above is probably the best guess unless the phone company does some engineering work. With the system assumed above a broadcast quality TV signal would be delivered to each of the 20 sites (its already at the studio site) for approximately 2 million dollars per year. No provisions have been assumed to allow low-power transmitters to operate from repeater sites. The phone company probably would not allow this.

Other Licensed Communication Common Carriers

Two other licensed communications common carriers, Western Microwave and Intermountain Microwave, presently distribute TV signals throughout the state. Western Microwave brings national TV programs from Salt Lake City to Montana through Monida Pass via microwave. These signals are distributed to TV stations and cable TV systems along a route that extends from Kalispell, Missoula, Butte, Helena, Bozeman, Livingston, to all the cities on the Yellowstone River, plus

Great Falls and Lewistown. Intermountain Microwave serves the High-line area with TV signals from Spokane. Cities on their route include Kalispell, Polson, Missouls, Hamiliton, Cutbank, Shelby, Harve, Great Falls, and Glasgow. The rates that these companies charge their customers must be approved by the FCC. If the state of Montana had a TV signal carried by one or more of these companies, the state would have to pay enough to cover added incremental costs, a share of the total system costs, and a profit to the companies.

Mr. Don Herman, the Montana Manager of Intermountain Microwave was contacted relative to how his company would relate to a state PBS signal. Intermountain Microwave delivers TV signals to cable TV companies. Intermountain would like to have a PBS signal to deliver to the cable companies. A Spokane PBS signal would be delivered but an interfering signal is present at the Intermountain receiving site near Spokane. The Spokane signal, at the site, is not of usable quality. The microwave company will cooperate with the state as long as the plan is not detrimental to their microwave system operations or profits.

International Microwave would share sites and expenses if the state wants to install a parallel system for its own TV signal distribution. For a relatively nominal fee they will carry the signal on their equipment. The signal would then be available to the state for use at the terminal cities and the signal would most likely be carried by the cable systems. Arrangements could probably be made to have low-power transmitters operate off the mountain repeater sites of the system.

Notice that there are at least two ways to consider who pays the microwave system company that is delivering a state PBS signal to a community. The state would like to broadcast the signal so that the signal gets to non-cable TV households and the signal can be retransmitted to reach distant rural areas. The cable TV operator wants the signal for the cable. The cable operator also worries about losing customers once the state has the PBS signal available to an antenna at a residence. The state could pay the microwave company for delivery of the signal to the community; the state could transmit the signal; and the cable TV operator could get his signal free from an antenna. A second option is for the cable TV

operator to pay the delivery bill to the microwave company for delivery of the signal to the cable. Then the state would want to use the PBS signal from the cable to feed a low-power transmitter. Remember that most cable companies are willing to pay to have a PBS signal from outside Montana delivered. Both the state and the cable companies want the PBS signal. Cooperation should provide compromises that would make the signal delivery costs reasonable for both parties.

Mr. Dell Matthis, General Manager of Western Microwave, Inc., Bozeman, also would like to cooperate with the state in developing and distributing a PBS signal to the people of the state. Mr. Matthis has a plan for PBS which he believes would work well for the state. His plan is included at the end of this report under the "Matthis System".

Western Microwave will add the necessary electronics to carry a state PBS signal on their system. Mr. Matthis' "very rough, no commitment" estimate to carry the signal, with origination in Bozeman was for $500,000 initially and $30,000 to $40,000/month. This would produce a broadcast quality program in all the Western Microwave communities except Dillion. That is, these communities would have the program, Kalispell, Missoula, Deer Lodge, Helena, Great Falls, Anaconda, Butte, Whitehall, Bozeman, Livingston, Big Timber, Columbus, Lewistown, Billings, Red Lodge, Forsth, Hardin, Miles City, Glendive, Baker, and Sidney. The very rough costs can be extrapolated to a yearly basis. The first year would be $500,000 plus $360,000 to $480,000 producing totals of $860,000 to $980,000 for the first year. The second year, however, the relative costs would come down to $360,000 to $480,000. There are also 14 repeater sites on the Western Microwave system where the PBS signal could be made available for low-power transmitters. This would require some more equipment and costs but they would not be significant compared to the other equipment and costs.

The combination of the two television common carriers would cover the state well with PBS signal outlets. If national PBS and Montana programs were carried by the Montana PBS the cable systems would carry the signal. Low-power transmitters could carry the signal from the terminal towns and repeater sites to rural areas.

If the low-power transmitters are UHF the signal can be carried to most rural communities in the state. An isolated community (relative to a microwave feed system for cable TV) would welcome the PBS signal both for its cable system and for non-cable users. Note Figure 6.

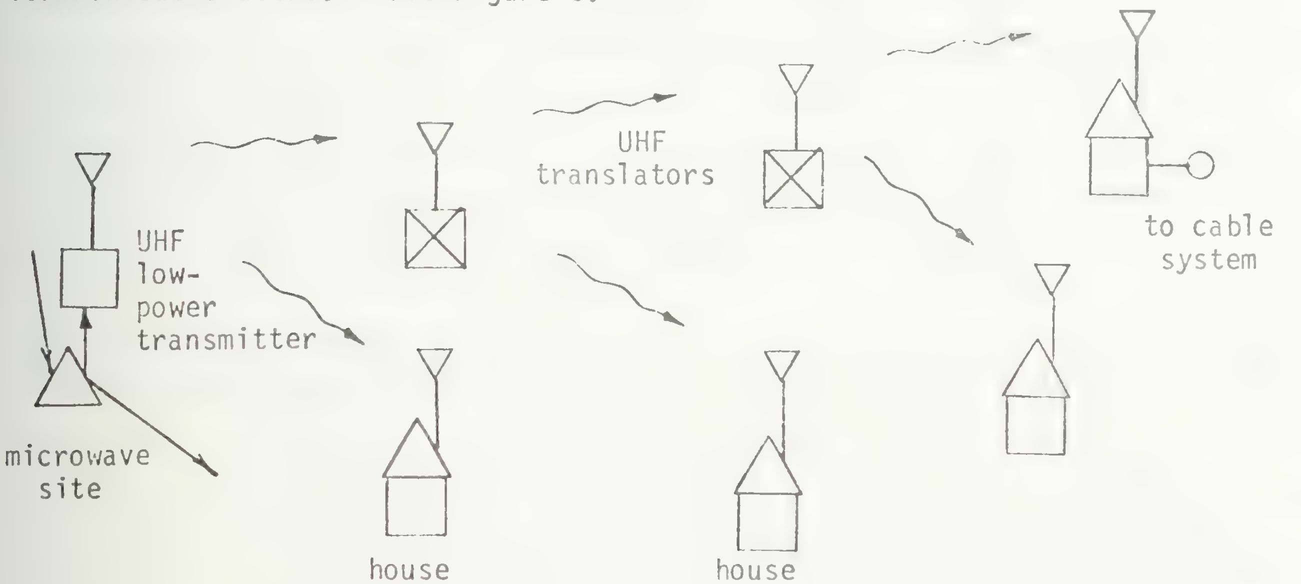

Figure 6. Microwave site feeding low-power UHF transmitter which feeds two UHF translators. Rural residences receive signal. A cable system is fed from one receiver.

SATELLITE SYSTEM Television signals of broadcast quality can be distrubuted to distant points via satellite repeaters. Home Box Office, many national PBS TV programs, several "superstations", and several religious stations are among the users of satellite systems. All of the national commercial TV networks use satellites for some of their program distribution. The demand, according to several people working with satellite video systems, is growing rapidly. Further, the costs are coming down quite like the cost of computers is coming down. There are more than 96 up-link (transmit) stations and at least 4000 earth stations (receiving sites) presently operating in the U.S.

The fundamental components of a satellite communications system to distribute a TV signal to several locations is shown in figure 7. The TV signal is the input to the system. At the up-link terminal the TV signal is used to FM modulate a 6 GHz microwave signal. This signal then passes to a high-power amplifier. The output of the high-power amplifier, usually in the range of

1-3 kilowatts, feeds a large parabolic dish antenna through a waveguide. The antenna usually recommended for up-link stations is a 10 or 11 meter diameter antenna. The large antenna is needed for two purposes; first it provides a beam of microwave radiation narrow enough to provide the satellite with an adequate signal level and secondly, the beam of radiation is narrow enough so that no significant portion of the radiation, in this case the microwave signal, hits the next satellite which is only three degrees of arc away. The FCC has strict limits on up-link antennas. A seven meter antenna meets their minimun requirements but the larger antennas are recommended, primarily because the satellites perform better with high levels of received signals.

The satellite appears as a microwave repeater site in the sky. The satellite recieves the modulated 6 GHz signal and translates the signal (with its modulation) to the 4 GHz range and then transmits the 4 GHz signal back to earth. The satellite, or "bird" as it is commonly called, is in a geo-synchronous orbit about the equator. Relative to a point on the earth's surface the satellite appears to be stationary. If an up-link uses only one satellite, its antenna could be permanently pointed at that satellite. Most up-link antennas are steerable, however, so that more than one bird can be used. Sometimes this is normal operation but occassionally there are equipment failures on satellites such that a

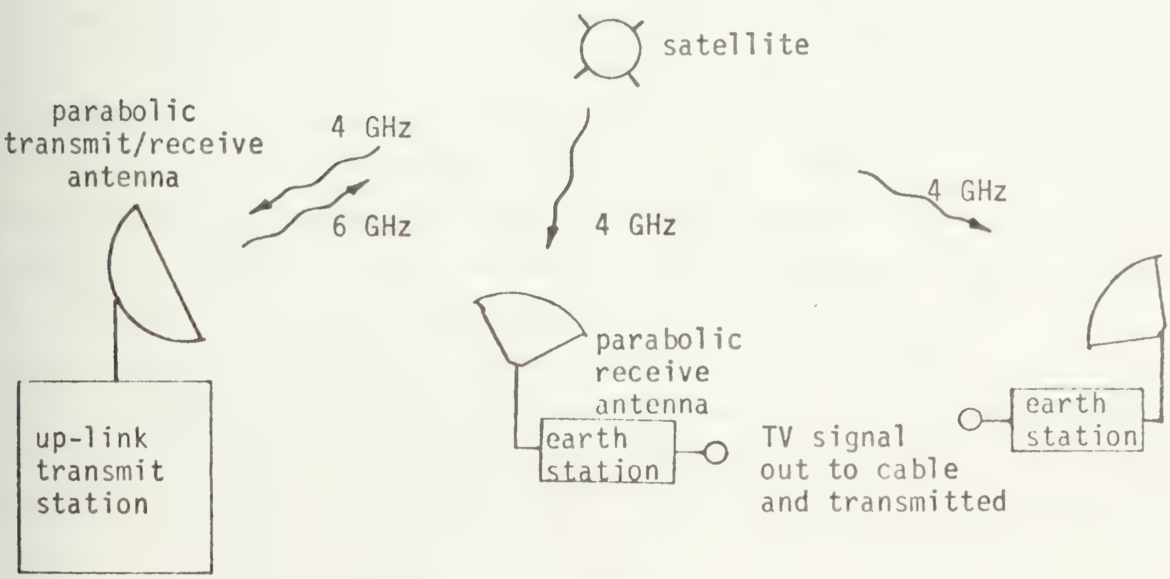

Figure 7. Block diagram of satellite communication system

particular communications system will have to use a different satellite. When this happens the system antennas have to be re-directed to a new satellite.

At the satellite the 4 GHz signal is transmitted back to earth. The transmit antenna at the satellite sends out a norrow beam of radiation such that only certain rather large areas of the earth are illuminated by the signal. Some satellite antennas illuminate an area on the earth to roughly match the contiguous 48 states while other antennas can illuminate smaller areas. A relatively strong microwave signal from the satellite will be received by a parabolic dish antenna pointed at the satellite if the antenna is in the illuminated area. If the receive antenna is not in the area illuminated by the satellite antenna it will receive no signal from the satellite.

The receiving antenna, electronics, and building for a satellite system are commonly called an earth station. An earth station receives the 4 GHz signal from the satellite, demodulates the signal, and has as an output the signal that was originally modulated onto the system at the up-link, in this case the TV signal. The quality of the TV signal out of the earth station is a function of the quality of the original TV signal into the up-link, the up-link power and antenna size, the satellite antennas and it's transmit power, and finally the size of the earth station antenna. The foregoing list ignored signal degradation caused by the various electronic signal processing in the system (such as modulation, transmitting, receiving, and demodulation). An earth station with a 3.6 meter diameter parabolic antenna will provide, at the earth station output, a signal with good quality for a home receiver. Often antennas with 3.6 to 4.6 meter diameters are used with earth stations providing signals to small cable TV systems. A 7 meter diameter antenna allows the output TV signal to have a quality that meets the standards set for major TV stations. That is, major TV stations require high quality signal. Sometimes it is more feasible to use a 10 meter diameter antenna for an earth station because less critical electronics is needed than when a 7 meter antenna is used to produce the same "excellent quality TV signal.

The up-link in a satellite communication system may or may not be in the area

on the earth illuminated by the satellite. For example, when a satellite is used to relay a signal from London to New York, the London antenna is not in the area illuminated by the satellite, which includes New York. If a satellite up-link was in Montana and if the satellite's illuminated area covered all of Montana, then the up-link antenna would be in the illuminated area. A parabolic dish antenna can transmit at one frequency and receive on another. In many instances the up-link station also receives the satellites's transmitted signal to monitor quality of the signal being received on the ground.

Most up-link and most significant earth stations have redundant electronic circuits. These reduncant circuits are switched into operation if the primary circuits malfunction. The monitoring of the primary circuits and the switching are done automatically. In the up-link there are two sets of modulators and high power amplifiers and in the earth stations there are two receivers and two demodulators. Reliability of these redundant systems far exceed that of the single systems. The cost, of course, increases.

An up-link terminal with a steerable 10 meter diameter antenna, commonly called a 10 meter dish, without a redundant transmitter, will cost approximately $250,000. This system is very complete and adequate except in case of transmitter failure. A transmitter failure may put the up-link out of operation for several hours to a day or two. An up-link with automatic monitoring and automatic protection (switching in the redundant transmitter) presently sells for $325,000 to $350,000 from one company and $450,000 to $500,000 from another.

Earth stations are much more varied than the up-links. A 3 meter parabolic dish and the necessary electronics to produce a good quality TV signal for a home or small cable system can be purchased for $10,000. The antenna is not easily movable and the electronics does not have redundancy. Another manufacturer sells a 20 foot dish which is not movable and the electronics has no redundancy for $25,000. The manufacturer says the 20 foot antenna is well made using steel and aluminum. Both earth station manufacturers do not include foundations, building, nor electrical power to the site, in their prices. A 7 meter dish, capable of producing a network quality video signal (excellent quality) that is not steerable

used with non-redundant electronics, will cost $30,000 to $35,000, again with the manufacturer doing no local ground work. A full broadcaster's earth system (one capable of providing a broadcast quality TV signal) with a 7 meter steerable antenna, total automatic redundancy in the electronics will cost $79,000 installed and tested by one manufacturer. Incidently, a few years ago the cost of a full broadcaster's earth station was ten times that cost. The prices of up-links and earth stations are still coming down.

One manufacturer suggested that at some earth stations, where the possibility exists that an up-link may be desired in the future, a 10 meter steerable dish be installed for the initial station. Then if automatic redundant electronics were used, the earth station cost would be $125,000. A different antenna would not be needed to convert the station to an up-link in the future.

In Montana it is suggested that heaters be put on certain areas of the parabolic antennas. The cost of this is $3,000 to $4,000. If an antenna is put in a very severe ice environment, it is recommended that the whole antenna be heated. This may cost $10,000 to $15,000.

A steerable antenna can be pointed at a different satellite through a motorized control system. A non-movable antenna cannot be redirected in a matter of minutes but it can be redirected in several hours. A steerable antenna can be pointed at one satellite for a particular program and can be redirected to a different satellite to receive a second program in several minutes (one company claims to do it in a minute). The non-movable antenna is redirected only if a major event occurs.

Finally the cost of the satellite repeater must be considered. Even though there are many repeaters (transponders) on a satellite, their cost, or more appropriately, their rent, is not cheap. A video transponder on a Western Union bird costs $300 per hour. A full time transponder with Western Union costs 1.8 million dollars per year, commercial rate. If the TV signal has some educational programs, an educational tariff may apply and the yearly rate is less. Radio Corporation of America, RCA, owns Comsat Satellites. RCA recently

sent new rates to the FCC for approval. They hope to lease a video satellite transponder for 1.5 million dollars per year but it is unprotected. That is, if the transponder fails, the leasee has no communications channel. A protected channel rents for 1.8 million dollars per year. If that transponder goes bad, it will be replaced. The cost of transponder rent has also come down. People in the industry believe they will become more plentiful and less expensive. RCA suggested that if the state of Montana wanted to rent a transponder in 2 or 3 years, RCA should be notified. Western Union, on the other hand, plans to launch two satellites in 1982 with 24 video transponders on each. All of the transponders have been requested already.

STATE SATELLITE SYSTEM CONSIDERATIONS A state satellite system to distribute the PBS TV signal throughout the state is not difficult to conceptualize. A single up-link could be used to deliver the signal to a satellite which in turn illuminates at least the state of Montana with a 4 GHz modulated signal that can be received at as many earth stations as desired. The up-link terminal costs will be assigned a value of $400,000. The up-link terminal will probably be at the PBS studio; hence site and building costs are considered to be trivial compared to the other up-link costs. The signal can be delivered to Billings via an earth station with an antenna and electronics so that the signal has adequate quality for retransmission over a high powered VHF TV station (if that were desired) and the signal can also be delivered to Ennis or Plentywood with quality needed for the local cable systems and a low powered transmitter. The cost of the Billings station might be $70,000 while the Ennis and Plentywood earth stations might cost $10,000 to $20,000 each. These costs are for the antennas and electronics. The site costs are not included but they should not be excessive because the earth stations can be located in friendly locations including in cities or towns or on the outskirts. Of course they can be located on mountain tops.

Different state designs using a satellite system to deliver a PBS signal to locations throughout the state are easy to consider. The state could deliver a broadcast quality signal to each city that presently has a TV transmitter (there are eight such cities) and a low power transmitter quality signal to each other county seat. If a $70,000 price is assigned the broadcast quality stations and $15,000 is assigned to the smaller stations, then the cost would be $1,280,000 for earth station electronics and antennas. The up-link and earth station costs would then be $1,680,000. To make the system work the first year would also require a transponder charge of 1.8 million dollars. The second year's operation would require a transponder charge and maintenance of the up-link and earth stations. This maintenance charge should not be excessive. Some of the county seat communities already have earth stations feeding cable TV home delivery systems. Chances are that a PBS transponder would not be on the same satellite that the existing antennas would be looking at, and hence, a seperate antenna and electronics would be needed (which is the earth station).

Another state design comparison could involve satellite earth stations to each of the 21 cities served by the state-wide microwave system laid out by McLeod and March(1). The eight cities which had broadcast quality signals from their earth stations in the previous example are assumed to have that in this example. Each of the other thirteen cities are assumed to have $15.000 earth stations. The earth station antenna and electronics costs would be $755,000. Again the up-link charge of $400,000 would bring the total to $1,155,000 for equipment plus, again, the $1.8 million per year for transponder usage. Such a system would be poor usage of the satellite system capabilities. The important advantage of the satellite system is that the TV signal can be delivered anywhere in Montana with very good quality for $15,000. Thus it can give a signal to Broadus, Gardiner, Thompson Falls, or West Yellowstone.

A proper state-wide system design using a satellite system would require population studies as well as distribution system capabilities from the receive earth stations (that is, how far can the TV signal propagate from the receive station?). A significant number of states have up-links for PBS signals but most of these are not used continuously. Generally signals are fed to PBS/ETV studios in major cities of the state. These major cities often have populations exceeding that of Montana. Then, too, national PBS signals that can be received on earth stations are not in a format that allows direct use of the continuous signal for cable or transmitter use. That is, PBS does not allow use of their TV signal that is available via satellite unless it is passed through a PBS station with identifying capabilities.

Alaska is in the process of establishing a state-wide PBS/ETV system that uses a satellite transponder. The University of Alaska Instructional Telecommunications Consortium is the operating agency for the state-wide system. The system came into being as a result of a legislatively mandated study of instructional television. Isolated Alaskan communities, where instructional TV was probably most needed, were left out of any terrestrial microwave system. A state system using satellites overcomes this problem. An up-link will be used in Anchorage with 240 earth stations scattered throughout Alaska. A transponder leased from RCA Satcom will be used, with an annual rent. With the 240 earth

stations, every community with 25 people or more will have the PBS/ETV signal available. The system will provide "not only direct instruction, K-12, Post Secondary, and Higher Education, but also cultural, educational, and public affairs programming".(2) Most of the earth stations will have a low-power TV transmitter associated with it so that the signals can be sent throughout the communities. Local communities will also be able to disconnect the earth station feed to the low powered TV transmitters so that local programs can be transmitted.

The first several paragraphs of the FCC's discussion relative to Alaska's request for the authorization to have a "direct satellite feed to low-power TV transmitters" is of interest. These paragraphs are reproduced in Appendix B. In the writing, a PTV station is a public television station and a mini-TV is a low-power TV transmitter.

TELEVISION SIGNAL DISTRIBUTION TO RESIDENCES

VHF Transmission

TV channels 2 through 6 occupy the electromagnetic frequency range from 54 MHz to 88 MHz and channels 7 through 13 are in the frequency range from 174 MHz to 216 MHz. These frequencies are in the frequency range designated Very High Frequency, VHF. Channels 14 through 69 are in the frequency range 470 MHz to 806 MHz, a frequency range called the Ultra High Frequency, UHF, range. The VHF channels generally are developed first in an area because of better propagation characteristics and lower transmitter costs. All of the TV stations in Montana are VHF. More large VHF stations could be added in the state without serious degradation to the existing high powered signals. The FCC, at some time years ago, reviewed the population and land topology to determine a channel assignment arrangement for U.S. cities that would work with minimun interference. Some of these channel assignments were for commercial stations and some were for PBS/ETV stations. Such channel assignments were made for the larger cities in Montana. Generally there is a VHF channel for PBS/ETV available in most of the larger communities of Montana. Thus it is probably possible to get an FCC license to establish a high powered (10 kw to 300 kw) VHF station in these communities.

The FCC has said in the past that if a TV station was established to serve a community, the signal from the station had to be very high in amplitude within the city served. The residents of the city should not need an antenna outside the residence to receive an excellent quality TV signal. Then, too, commercial stations wanted to serve the rural areas around the cities. There are some very high powered TV stations in Montana. These stations were expensive. Not only was there a studio but generally the main transmitter was on a nearby hill or mountain. A microwave system was needed to get the signal from the studio to the transmitter and then the signal had to be modulated onto the proper channel, passed through the transmitter, and then to the antenna. This is shown in block diagram form in figure 8. Occassionally the studio and the transmit antenna are located at the same site.

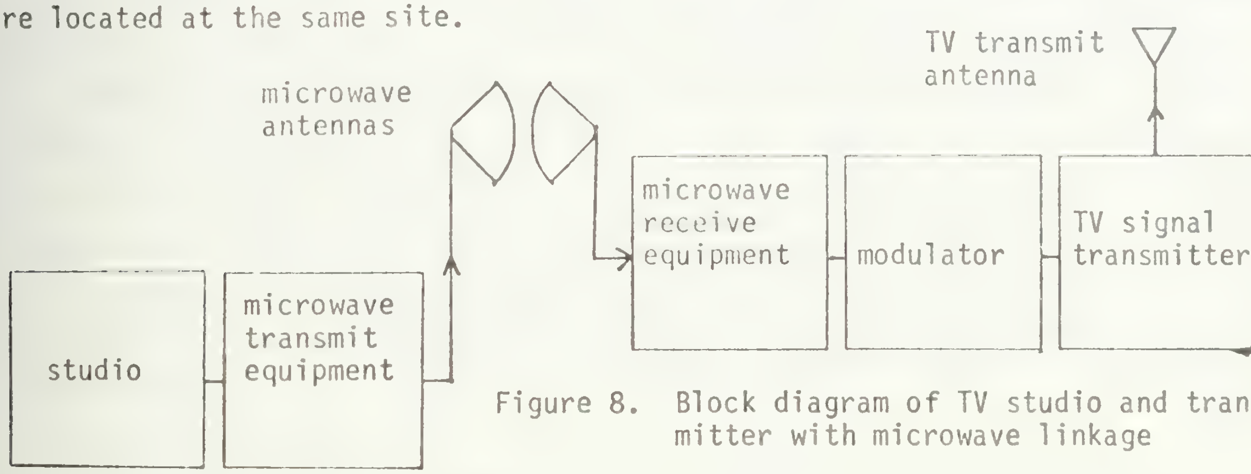

Figure 8. Block diagram of TV studio and transmitter with microwave linkage

The coverage from a high powered VHF TV station is a function of the power transmitted, the height of the antenna above the average terraine, the height of the antenna above ground, and the gain of the transmit antenna. A typical station will cover a 15 to 30 mile radius with a strong signal (grade A) and from there to 50 to 80 miles away with a signal that can be received with good quality on a gain antenna. There are wide variations in these distances depending on the station and the nature of the terraine around the station. A receiver with a good antenna on a mountain top 100 miles away may receive a good picture while a residence in a valley 40 miles from the transmitter may receive a very poor quality signal.

FCC TV applications for TV stations must list expected construction costs. The costs include all communication electronics, the studio, studio equipment, and other allied parts and services. Typical values listed by applicants are in the range of 1.7 million dollars (a recent channel 13 request from Salt Lake City with a 60 kw effective radiated power for the visual portion of the signal) to 2.1 million dollars (for example, a request from Central Wyoming College in Lander, Wyoming to use 100 kw effective radiated power on Channel 4 has an estimated construction cost of 2.12 million dollars). If Montana were to install a collection of high-powered transmitters in the state (probably 5 to 7 would give good coverage of the state) it would probably be decided that each transmitter should have at least a modest studio associated with it. This would allow local programs, political debates, county agent reports, emergency considerations, and the like to be transmitted for a region of the state. Thus the costs for the high-powered stations are probably going to be similar to the costs observed elsewhere. If an attempt were made to cover the state with 5 transmitters, the cost of the stations might be 2 million dollars each. Then, with these assumed prices, the 5 stations would cost 10 million dollars. If instead 7 transmitters were used each could be less powerful resulting in less cost. Let's assume the cost at 1.7 million dollars per station; the 7 stations would then cost 11.9 million dollars.

The performance of these stations would be similar to the performance of the Butte station or the Helena station or the Billings stations. Many rural areas would need to use translators to get a usable signal as they do now with the commercial station signals. A signal would be available for most cable systems in the state. In some cases a translator would be needed to get a usable signal to some of the smaller community cable systems, as is the case now with the commercial signals. The performance of the system is not difficult to visualize and was considered in detail in the PBS/ETV considerations in the state of Montana several years ago.

There are some factors that need to be pointed out relative to high-powered VHF stations and their impact on Montana. If a high-powered VHF station is located near a community with a cable TV system, then the radiation from the station

will probably interfere with the cable signal at the same channel frequency. Usually the cable system can not use that channel for a signal. This may mean the deletion of one of the signals the cable TV viewers have been watching. Also, the new TV signal will have to be carried by the cable system (the FCC requires the cable to carry all local TV signals). If the cable system had all channels used, another station originally on the cable would have to be dropped. Allied with these considerations is the fact that several cable systems are expanding the number of channels carried so that a new signal can be added without dropping any currently carried stations. A trivial rearrangement of channels on the cable may be needed in this latter case.

The high powered VHF stations may also cause some problem to the network of VHF translators present in the state. The FCC will require all nearby translators operating on the same channel as the new station to cease operating. Some areas of the state have station signals or translator signals on each VHF channel. Again some viewers will lose signals they presently watch. Because of the crowded VHF channels, the new signal from the high powered transmitters may not be able to be translated to a VHF channel. A UHF translator may be required which is more expensive and the residents must purchase a new antenna which is small and relatively inexpensive ($20 to $30). The state of Montana would have to consider sharing UHF translator costs to help distribute its signal to all people.

High Powered UHF Stations

A collection of UHF high powered transmitters could be used to distribute the PBS TV signal. The UHF stations would not be less expensive than the VHF stations and their performance would not be better. Their performance, which is nearly limited to line-of-site, would not be appropriate for most of Montana where the land topology is not flat. UHF stations work well in areas of country which are flat. In such areas a UHF antenna is commonly mounted on a 1000 foot tower on the highest ground in the vicinity. Then, with a significant amount of power (30 to 55kw) and a gain antenna, good coverage can be given to those locations in line-of-sight. In Western Montana the locations that are line-of-sight from most mountain tops are generally limited to one or two valleys and

then other mountain ridges and peaks. The high-powered UHF stations are not appropriate for mountainous terraine. A UHF station in Central Montana probably does not produce a usable signal at most residences 20 to 30 miles away. Eastern Montana is the most appropriate location for a UHF station but even there most rural residences are in valleys. High-powered UHF stations are not an appropriate TV signal choice for good coverage of rural Montana.

UHF stations do have several characteristics that are advantageous. One of these advantages is that the signal does not interfere with a VHF cable system. The UHF signal can, however, be easily received, translated in frequency, and put onto a VHF cable system. Another advantage is that there is less electromagnetic noise in the UHF frequency range and hence if a signal can be received, it is generally excellent quality. Further, receive antennas are not expensive. These factors allow a UHF signal to be received at a distant point (a high gain receiving antenna may be needed), translated in frequency, and retransmitted probably using another UHF channel. This process can be repeated two and sometimes three times. The quality of the resulting video picture is degraded with each translation but it has beeen found to be of acceptable quality after three translations. The possibility of using UHF translators to feed signals into valleys has to be considered. However using high-powered UHF stations to get the signal to a ridge overlooking a valley is not the most practical way to do it. A small UHF transmitter should feed an antenna pointed at the ridge.

A NEW POSSIBILITY-LOW POWERED TRANSMITTERS The FCC has recently decided to allow a new class of TV transmitters located, output power-wise, between common translators and major stations. The new category is tentatively labeled "low-power transmitters". The rules and regulations, if they have been determined, have not yet been published. In mid June an FCC engineer said there were more than 4000 applications on file for low-power transmitters. The FCC engineer said that 1 kilowatt transmitters will be allowed at locations more than 250 miles south of the Canadian border. At locations north of 250 miles south of the border 100 watt units will be allowed. The low-power transmitters do not have to be manned whereas at higher power levels someone that can control the transmitter has to be able to monitor (observe on a TV set) the signal from the station.

Also, apparently the FCC will allow these low-power transmitters to serve cities. Many of the low-power transmitter applications are to operate the transmitter from an earth station. A new name is even being used for this latter arrangement, namely "satellator". A block diagram of a satellator is shown in figure 9.

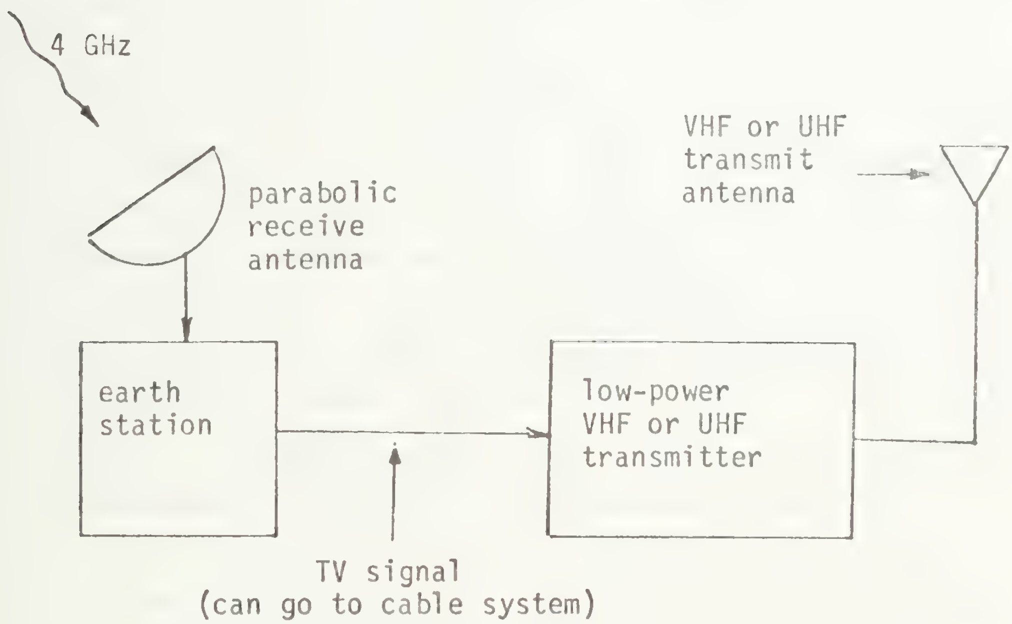

Figure 9. Block diagram of a satellator

The low-power transmitters will be allowed to receive their signals from other sources such as microwave systems, probably recorders, and maybe even other TV stations. The nature of the antennas allowed is not yet public information. Engineers working in the area of low-powered transmitters have said that the FCC will probably be very strict on the ruling about 1 kw VHF transmitters not being allowed within 250 miles of the border. However they expect the FCC to make exceptions for 1 kw UHF transmitters. That is, the engineers speculate that the FCC will allow them to be present nearer the border, but as exceptions. This possibility allows a new method of signal distribution to be considered, namely UHF low-powered transmitters.

In Montana very few of the UHF channels are used. Thus if a TV signal could be delivered to a significant number of locations, low-powered UHF transmitters,

if allowed, could distribute the siganl to the people of the state.

One hundred watt UHF translators have been allowed for several years by the FCC. This size transmitter is sometimes fed to an omni directional (in all directions) antenna that has gain in the horizontal plane (if you are located some distance horizontally from the antenna, the signal you receive will be greater than that which you would expect from a 100 watt transmitter feeding a simple dipole antenna). If the antenna is mounted on a high point, all residences within 20 miles, that are line-of-sight to the antenna, will receive the signal with excellent quality with a simple antenna. If a house is 30 miles away, but line-of-sight, the signal can be received with a more complex antenna. If a 1 kw transmitter were used with the same antenna, the distances for equal quality TV signals, each get multiplied by a factor of approximately three. Thus all residences within approximately 60 miles, that are line-of-sight to the transmitter, should receive strong signals and a site 90 miles away should be able to receive a good signal with a good antenna. From the site 90 miles away another UHF repeater can be installed to get the signal into another area. The process can be repeated again. The low-power transmitters would be more scattered than a few high-power UHF transmitters so that more rural residences would be line-of-sight to at least one transmitter. If a residence was line-of-sight to two such transmitters, either signal could be used for the local TV. The two signals would be on different channels and probably in different directions.

A grid of these UHF transmitters can be visualized providing an area with TV signals. Surprisingly few transmitters are needed to provide all of Montana with signals if the state is assumed to be almost flat; but it is not!
In order to see how well the state can be provided with TV signals via this system would require an extensive engineering project. It is obvious that in many instances UHF transmitters with less than 1 kw of power would be adequate. Often times directional antennas which point the energy in one general direction would be more advantageous than omni directional antennas. These UHF transmitter systems have worked well in Colorado and Utah. Another tool which

can be considered in such a system is the 100 watt VHF translators. In areas where channel crowding has not occured these could be advantageous. For example, a 100 watt VHF translator with four directional antennas, each pointing a different direction, has been installed in Montana. According to the translator man that did the work a good signal was received up to distances of 50 miles in each direction. Other arrangements of VHF translators can also help. UHF translators are often used to supply the input signal to VHF translators. Then, too, some southern parts of Montana are more than 250 miles from Canada. Low-power VHF transmitters near Broadus, Red Lodge, or Dillon might serve the areas well.

The UHF translators have two negative aspects. One is the fact that the units with power greater than about 20 watts have tubes in their power amplifiers. These tubes tend to last only about 6 months to a year. The UHF translators with 20 watts or less use semi-conductors throughout and are more reliable. A second draw-back to the UHF translators is that they are expensive. The electronics for a 100 watt UHF translator will cost at least $18,000. This price includes antenna and coaxial cable. In the past there has been little demand for 1 kw UHF transmitters. No post-development competitive cost was found.

CABLE TV SYSTEMS The majority of residences in the larger Montana communities receive their TV signals from a cable TV system. In Montana the cable systems carry a selection of programs (actually signals from different stations) on the VHF channels. If there are no strong interfering signals from local TV stations, all the channels can be used (2 through 13). The signals used by cable TV operators come from at least three sources, local stations, station signals brought in by microwave systems, and signals from earth stations. Sometimes a local weather and time channel comes from a local camera associated with the cable company.

A decade ago only large cities could justify cable TV costs. Today, especially with the advent of earth stations, cable TV systems are practical in much smaller communities. Companies that install cable TV systems say that it is desirable to have at least 400 homes in a community for a cable TV system to be

practical. However, cable TV systems are being or have been installed in smaller communities such as at Colstrip and Ennis. Present costs for a cable system are approximately $8,000 per mile of cable if the cable can be carried on existing poles. This assumes 60 users per mile of cable. To run the cable where there are fewer users per mile does not appreciably reduce the cost. If a buried cable is desired, the costs are approximately $11,000 per mile.

Most of the smaller communities in Montana do have or soon will have cable TV systems. The smaller communities generally don't have a microwave terminal available to get the variety of stations carried by the common carriers. Hence they would welcome more signals. Most of the smaller communities do not have a PBS/ETV signal available to them. If the state provides a PBS/ETV signal to them, they would gladly carry it on the cable system. Cable system operators might even share in the cost of getting the signal.

The larger cities have different problems relative to cable TV system use. Some of the systems have all the VHF channels used and the operators are not looking for new stations. Some of the systems which are presently full are being expanded and the operators would welcome new signals. Other systems are not fully utilized now and a PBS/ETV signal would be very welcome. As mentioned earlier, a cable TV station must carry the signals that are available to the city residents via a simple antenna. If the city were to receive a PBS signal via a low-powered transmitter, it is not clear whether the signal would have to be carried on the cable; however, it is probably true that all the cable systems that have all VHF channels used have KUED, the PBS station from Salt Lake, carried on them. Most cable system operators would be pleased to convert that channel to a Montana station if the Montana station were of equal or more interest to Montanans. Note that presently the Montana cable TV systems that carry KUED out of Salt Lake pay the microwave common carrier for the signal. The microwave common carrier serving the high-line area has no PBS/ETV signal available for customers at this time.

COMBINATIONS OF LONG DISTANCE AND LOCAL SIGNAL DISTRIBUTION

Microwave Signal Transport-Transmitted Distribution

A small number of high power transmitter stations has been discussed prior in

this report. The resulting coverage from such a set of transmitters was marginal without a substantial number of translators to feed the rural areas. The cost of the high power transmitter stations was high but local programming was a desired feature. The stations were going to have manned (FCC regulations).

Such a collection of stations would be expected to receive much of it's programming from a central state studio. The reasonable way for the central studio to get the signal to the large transmitters is via microwave systems. The state is adequately covered by common carrier microwave systems so that the state could get it's signal delivered to any major city site. If the state were to have it's own microwave system for other communication systems, again most major cities would be on the system and the added equipment to carry a TV signal would not be expensive (relatively). A state-owned microwave system for TV signal distribution only does not appear to be economic.

Microwave Signal Transport-Cable and Transmitted Distribution

If the TV signal is delivered to the several cities with high power transmitters operating, the response of the cable TV system operators will be varied. In the major communities that have the transmitters (and in some nieghboring communities) the PBS signal will have to be carried on the cable (FCC rule). In communities where the signal is not received with good quality the local cable company does not have to carry the signal. If KUED is available with goood quality from a microwave common carrier, the cable operator may continue to use that signal. If the state were to bring in the PBS signal to the community via microwave or translators, the cable system would carry the signal. Obviously if the cable at a community does not have a PBS signal, they would like to carry a state PBS signal if it were available. Such a cable system is present in Ennis. Clearly there is room for negotiations to get the signal to such communities. The cable system operator is probably not too interested in providing over-the-air PBS signals to non-cable TV subscribers in the area, but the state should be. The problem at Ennis could be solved with a strategically located translator. The signal to the translator might come from a high-powered transmitter near Butte.

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Another option available with microwave systems used for long distance distribution uses low-power transmitters and translators to get the signal to residences. The microwave system, be it state owned or leased, will have many repeater sites throughout the state as well as terminals in most major communities. If a low-power UHF or 100 watt VHF transmitter is used from each terminal site and from many of the repeater sites, the major communities will have the signal and an excellent quality signal from a high elevation will be available for certain rural areas. The signal coverage in the rural areas can be extended using translators, especially if UHF signals are used. The cable systems in the cities with microwave terminals in them would probably carry a Montana PBS signal if it had the national PBS programs of interest on it as well as Montana programs. The smaller communities without a microwave terminal, for example, Ennis, might be able to receive a signal from a microwave repeater site (where a low-power transmitter was located) or a translator might be needed. Again, the cable system in such communities would be pleased to carry the signal

A microwave distribution system, even with only low-power transmitters, does allow some flexibility relative to different programming for different parts of the state. The central state PBS signal, for example, would be delivered to Billings. At Billings a studio could change the format and insert programs of interest to Eastern Montana. From there, going east at least, the Billings signal could be carried. Exactly where the signal would go would be a function of the microwave system layout.

The microwave to low-power transmitter to translator possibility will be discussed in more detail later in this report.

Passive Earth Station-Cable Distribution

A Montana PBS station with an up-link to a satellite transponder allows a passive earth station to be able to receive the signal with broadcast quality. The signal can be fed to a cable system. In large cities the state would want a transmitter to provide a signal to non-cable users. The cable systems would probably carry the signal. In the smaller communities with KUED available via microwave, a cable TV operators decision to carry the Montana signal or not would depend on the cost of getting the signal and its popularity. A cable

system with no microwave KUED available would carry the Montana signal if the signal acquisition costs were not too expensive. Again, an earth station in Ennis would probably feed a low-power transmitter also and the state would at least share expenses of the earth station.

Passive Earth Station-Transmitted Distribution

Using the satellite channel to get a TV signal to a few high-power transmitters does not use the satellite channel capabilities well. The satellite channel has advantage only when many earth station sites are to be served. With a grouping of high-power transmitters practically all communities in the state could be served either by the transmitters or translators (sometime several translators would have to be in series). The satellite channel is not appropriate and too expensive.

Passive Earth Station-Cable and Transmission Distribution

A satellite system can be used advantageously to serve a collection of low-power transmitters in many communities. At least one earth station and low-power transmitter can be considered for each county. Maybe for the major communities a moderate high-power transmitter is used (like the 10 kw commercial unit at Miles City). Billings would have an earth station with transmission capabilities. The cable TV system might be required by law to carry the signal (FCC rules not out yet if the transmitter were low-power). Again, if the national programs were available and the programs originating in Montana were good quality, the cable operators would gladly carry the Montana PBS signal. Those communities without a microwave feed system to the cable system would be pleased to have a Montana PBS signal to carry. Either via an earth station or a transmission most communities would have the signal available. For example, Ennis might have an earth station because it's a county seat while Ronan and St Ignatius might receive the signal via a low-power transmitter operating off an earth station at Polson. Isolated communities like West Yellowstone could receive the signal via an earth station or via one or two translators from Ennis.

Chances are very good a Montana PBS signal would not use the same satellite th most cable companies now look at with their antennas. Thus, the existing earth station antennas probably can't be used to receive the Montana PBS signal.

A satellite system also can be used advantageously as an educational tool. Special classes, for which a small community may not be able to hire an instructor, could be presented via the satellite system so that the small community school could have it available to the students. For example, students graduating from some of the larger high schools in Montana not only have had trigonometry but also the have had a quarter or two of calculus. Students graduating from some small high schools don't have this opportunity. The satellite system could provide a more nearly "equal educational opportunity" to all Montana students. Classes could be presented in the morning hours over the system or, as an alternative, the classes could go over the system at night, from recordings made earlier, and then recorded at appropriate sites for presentation the following day. The recordings at the remote locations could be automatically started by signals originating at the system up-link.

A satellite transponder can carry only one signal at a time. Thus only one up-link is essential and all the earth stations will receive the same program. However, more than one up-link may be desired; it is certainly possible and many of the existing satellite systems do have more than one up-link. Obviously only one up-link can work at a time. The second up-link will cost as much as the first up-link but the system reliability will be significantly improved. If a system has only one up-link and a catastrophy occurs, like an equipment fire or severe antenna damage, the whole system is idle until the up-link is repaired. With two up-links the system can survive one catastrophy. Then, too, more than one studio and up-link may be desired due to program origination points. Multiple studios can also be handled in another way. The studios not near the up-link can transmit signals to the up-link via microwave, either state owned or leased. Up-link reliability with this process is not helped but the costs would be. Local origination of programs can occur at any earth station relatively easily. This is discussed in the next section.

Local Origination-Cable Distribution

Some cable systems in the state of Montana have had capabilities for the local origination of programs. At least one cable system, with local program origination capabilities, had a channel left vacant to use for such programs. The system manager says that in 15 years he had only one or two non-university related requests to use the system. The local university did televise one set

of classes and televised the Bobcat-Grizzlie football game a time or two. Finally, with the purchase of an earth station, the cable TV company now uses all VHF channels.

The manager of the cable systems in Montana said that most cable systems do not have studio facilities such that local programming can occur. When asked "If the state of Montana installed a simple studio at or near your central terminal, would you carry locally originated programs?", he said "Oh, yes". He also said that cable TV systems would like to be involved in such activities. He also mentioned another possibility that the civil defense officials should consider. Equipment is made that will interrup the audio on all channels carried by a cable TV system and replace the audio with emergency messages. For example, this would alert cable TV watchers of danger from some disaster like the flood from a dam breaking or a fire.

There are no significant legal problems to putting locally produced programs on cable TV. If the cable has all channels used, usually at least two channels have the same program at the same time. One of these channels would be used for the local program. The small cable systems would welcome such programs but they probably can't afford a studio. Whoever supplies a studio needs to evaluate its need carefully.

Local Origination-Transmitted Distribution

The signal distribution option using high-powered transmitters had studios associated with each station. These studios were for locally developed programs. The local program would go out over that high-powered station and any translators using that station's signal. The program would also go out over all cable systems that were using that station's signal. County agent reports, emergency messages, adult classes, and maybe some sports events seem like appropriate programs. No longer is the signal confined to one community as it is with a cable system. Note that with the local programming done on the high-powered station, the local program propagates further and gets into the nearby cable systems. The local program is a part of the PBS station program.

If a satellite system is used with a family of earth stations, locally generate

programs can originate at each earth station. The earth station program will probably be used to feed a cable system and a transmitter. If a simple studio were nearby also, then the cable system and transmitter feed could be disconnected from the earth station and the feed replaced with the signal from the studio. Then the local signal would go to the cable system and to the transmitter and antenna. The propagated signal would probably be picked up by translators which would feed the signal to other areas. Other cable systems might also be receiving the transmitted signal which in turn would be put on the cable. Coverage from an earth station might be about the size of a county. The local programs could include high school events, county agent reports, emergency messages, political debates, and maybe sports events.

If the PBS signal were carried throughout the state via a microwave system with low-power transmitters broadcasting from city terminals and repeater sites, a locally generated program can reasonably be used only at the city terminals. The local high school debate team is not going to go to the top of a local mountain to conduct a debate at a low-power transmitter site. To relay the debate from a community studio to the mountain top transmitter is costly (but easily done).

Local Origination-Cable and Transmitted Distribution

Almost all options using cable systems and transmitted signals have been considered in the two previous sections. If a state PBS system were in operation with local programming it seems reasonable that the local programs should go over both the local transmitter and the local cable. This generally would occur under the conditions set forth above. The local programming option seems to favor a signal distribution system that does not cover too broad an area. The several large transmitter system of signal distribution practically makes county or city locally originated programs unsuitable as most of the viewers are not interested. For example, consider a debate about something of interest in Powder River County (Broadus) being transmitted via a big station in Billings. The debaters would also have to travel to Billings. With a microwave system feeding many sites, and maybe 20 cities, the local programs can be more "local". Finally, with a satellite system the location served can become that area served by an earth station.

THE "TERM" PROJECT AND ALLIED CONSIDERATIONS Montana State University has received grants to develope a system to develope and distribute TV programs to various Montana cities via the Western Microwave Company system during times when at least one channel is unused on the microwave system. For many years a TV signal link has existed between the MSU campus in Bozeman and the Western Microwave Company's feed point at Whitehall. Most of the signals carried by Western come from Salt Lake, over Monida Pass, and to the Whitehall repeater (via microwave).

Generally the color video programs will be on tape at the MSU TV studio. Late at night the tape will be played into the microwave system. The program will actually be carried throughout the microwave system and all cable systems attached to the microwave system. At certain terminals in towns served by the microwave system video recorders will be present. Prior to the start of a program on the pre-assigned channel, signals will be sent to start the recorders. The recorder records the program while it is present. At the end of the program the recorder stops, probably due to another signal sent from the studio. Thus the unattended tape recorder in Miles City or some other community will have a recording of the program for use the next day. The next day the program can be presented to groups on a monitor system or replayed on the local cable system or the program can be played on a local station. At least sometimes when the tapes are replayed to groups, an interactive audio system, the Educational Telecommunications System available through Eastern Montnan College in Billings, will be employed to let the audience talk with the people who made the program. A more complete description of the project is included in Appendix C. The Appendix C document is from the MSU Office of the Vice President for Research and contains general information about the project.

The costs of using the microwave system to do the TERM project as shown on the proposal are not too meaningful. The microwave company actually helped the project by supplying matching funds, in the form of reduced prices, for carrying the signals.

The TERM project has both some clever aspects and its results could have significant implications. Fortunately the only aspects of the project that are

of concern in this report are the long distance signal delivery system and the final delivery of the programs to the people. The late night use of the microwave system is good use of an asset. The unattended recording at the distant terminals is good use of modern technology. The programs could have been recorded at the Bozeman studio and delivered to the communities some other way, like via mail.

The TV programs are going to get to the people in several forms. It is hoped some of the programs will be carried on local commercial stations, all will apparently be on local cable systems, and some will be used for group presentations. The state can distribute programs to the people via recordings. The programs done this way are not going to replace KUED on the cable systems. It is not what is commonly called a Public Broadcasting System, PBS. It is more correctly a limited video educational system. Several of the signal delivery systems discussed in this report would fit well into this type of program delivery. For example, the high school calculus class could be sent over a satellite system and recorded automatically at the earth stations in the smaller communities. Actually, night use of any of the systems will provide access to program recording at most communities.

<u>THE NEVADA PROPOSED SYSTEM</u> Presently the only PBS station in Nevada is at Las Vegas, population 400,000 to 500,000 people. Reno, with a population of about 120,000, and the other Northern Nevada communities have no PBS. The University of Nevada is planning to build a PBS staion for Reno. An earth station will be built, and the programs will be transmitted using a 1300 watt transmitter on channel 5. Three fourths of the project funding will be supplied by the National Telecommunications Information Administration. The expected station costs are approximately one million dollars.

The Reno PBS staion is not going to be used, at least directly, to supply PBS to the other Northern Nevada communities. Mr. Dan Tone, Director, Office of Communications & Broadcasting, University of Nevada, Reno, has a plan to provide these communities with PBS. The group has even considered using their technique in two Montana communities. The PBS stations for these remote, smaller, communities involve a remotely controlled earth station feeding a

low-power transmitter. Presently national PBS has four transponders leased on a satellite. These transponders are used primarily to distribute programs from Washington to the PBS stations across the nation. However, the satellite channels are also used to distribute PBS programs from other areas, generally where PBS stations have up-links, to either state or regional earth stations. When this is done national PBS makes the transponders available at a reduced hourly rate ($150/hour instead of $300/hour that Western Union would charge). An earth station in Nevada or Montana can receive these programs. National PBS does not allow continuous direct rebroadcast of its transponder channels. Between each program the channel is used for transmitting information to the PBS stations that is of concern only to the stations and should not be broadcast. However, if a PBS station transmits some other signal during these several minutes each hour, the main PBS programs may be transmitted. PBS stations often give their station identification, acknowledgements, and announcements during these intervals.

Dan Tone's group wants the remote earth station to receive a particular PBS transponder signal while a desired program is being presented. When the program is over the station will show a station identification picture until another appropriate program becomes available from the satellite. Then the earth station will tune to that transponder frequency and the new program will be received and transmitted. The control of the earth station will be via computer and leased telephone lines. The computer will be in Reno.

The mini-PBS stations, as they are called, will each have a low-power transmitter operating and if there is a cable system in the community, the signal will be put on the cable. It will be possible to enter recorded or live programs at the station. The recorded programs will simply be played-back, replacing the earth station signal. Hence the recording will go out through the transmitter and the cable system. Then, too, adequate camera facilities will b provided so that some live events can be transmitted. It is hoped that the mini-PBS station can be located near some existing studio so that it can be used as the studio.

In each community a Community Programming Board will determine which PBS pro-

grams should be received and will evaluate and schedule local programs. The Board will then communicate their wishes to the people programming the controlling computer in Reno. The controlling computer will then be programmed to have the earth station receive the proper programs, with station identification between programs, or the station can be put into local control for either playing-back recordings or live programs. Refinements include music from the satellite to be put on the TV audio during station breaks and they hope to be able to have printed message capabilities for the video. The printed messages would be put on locally and might be programming notes or local brief news items.

The cost of one of these mini-PBS stations is estimated to be $80,000 to $85,000. This assumes a nearby studio is used. No operator is needed at the station unless local programming is occurring. The local community is expected to provide $25,000 as match money for federal grants. Most communities, including Roundup and Circle in Montana, that have considered the mini stations have considered the cost to not be a major problem. Note that special programs can be sent to these communities via an up-link using one of the PBS transponders for an hour or more. The mini-PBS stations would tune-in the proper transponder to receive the program. An up-link in Reno would be convenient but not essential.

The "Matthis System" Mr. Dell Matthis, General Manager of Western Microwave has a plan to develop PBS for Montana at reasonable cost. Initially the PBS system starts slowly and grows as funds become available. New technology, new FCC rulings, and existing facilities are all used to advantage.

The process used by the commercial TV stations in Montana to receive their programs is essential to this discussion. The Montana TV stations generally receive their national programs from Salt Lake via Western Microwave. The signals brought from Salt Lake to Montana stations still have Salt Lake commercials and Salt Lake TV station identification. The Montana stations "strip" the Salt Lake commercials and Salt Lake TV station identification. The Montana stations insert their own commercials and identification. This signal is then transmitted as the local Montana station's signal. Mr. Matthis

believes that a Montana PBS station can use the Salt Lake KUED signal in the same manner. That is, the PBS signal from KUED in Salt Lake would be delivered by Western Microwave to a Montana studio where the signal would be "stripped" of its KUED identity and a Montana identity put on the signal. Then, too, like the commercial Montana stations, the Montana PBS station would have the ability to delete certain KUED programs and insert programs of more interest to Montanans. The programs inserted could come from recorded programs or from live programs in the studio.

The signal from the Montana PBS station would then be put on the Western Microwave system (and surely Intermountain Microwave would cooperate) replacing the KUED program on Western's system and providing the first PBS signal on Intermountain. Presently the cable TV companies pay Western to carry the KUED program. Mr. Matthis believes they will pay all or much of the tariff for the cable companies to carry the Montana PBS signal. This then puts the Montana PBS signal into 21 of the larger communities (those with cable systems fed by microwave systems). Mr. Matthis believes that the cable system operators will allow the state to broadcast the signal from either the microwave terminal in each of these communities or from some point on the cable system. The broadcast will be via an unattended low-power transmitter. The cable system operator will cooperate (it is hoped) for public relations and perhaps for cost sharing. The low-power transmitters will provide the non-cable TV users in the community with the PBS signal. The transmitted signal, especially if it is UHF, will allow neighboring rural areas and communities to receive the PBS signal by using translators.

Both microwave companies have various repeaters, not in communities, in order to propagate the microwave signal across the state. Mr. Matthis would allow low-power transmitters to be installed at these sites on the Western system to send the PBS signal to the surrounding area. If the low-power transmitter for each repeater site is engineered well using directional antennas, good coverage should result. This signal can also be repeated, by translators, a time or two. The Western Microwave system has 15 repeater sites while Intermountain has 8. A charge would be made by the microwave companies to provide the appropriate signals at the repeater sites.

There are several areas of the state where special consideration has to be given in order for the PBS signal to get to the area. One of these areas is in and around Dillion. The Western Microwave signal that goes to Dillon comes from Salt Lake, not Montana. Dillon would have to receive a signal via low-power transmitter and maybe a translator or Western Microwave could put in the equipment to carry the signal from Whitehall to Dillon on the microwave system. This would be costly. The Libby area also is not served by a microwave system. Special engineering would be required there, too. Some areas in Eastern Montnan, like Broadus, Jordan, and other communities, would require special attention. This special attention might include a remotely controlled earth station (as being developed by Dan Tone at the University of Nevada) with some Montana programs available via the satellite. This would require an up-link; an out-of-state up-link could be used. The charges for the satellite transponder would be on an hourly basis. If a PBS transponder were used, the cost would be, at least in the second half of 1981, $150/hour. If the earth stations had been designed to also use a standard transponder on the same satellite, its cost would be $300/hour.

Mr. Matthis also points out that the microwave system, as it now stands, has the ability to deliver the KUED signal to Bozeman and then to carry a Montana PBS signal from Bozeman to all other microwave sites in Montana except Dillon. Within the Western Microwave system the equipment for doing this is all in place and operational (except proper signals at repeater sites for low-power transmitters). The nature of an agreement with KUED has not been investigated but no serious problems are foreseen. A Montana PBS studio in Bozeman could thus serve the state. If an earth station were constructed at the studio, PBS signals from satellites could be used for the station giving a larger selection of programs than is available from KUED.

HOW TO SERVE A TYPICAL CITY OF 5000 PEOPLE All cities of 5000 people in Montana have a cable TV system in operation. The cable system operator would carry a Montana PBS signal if it were available via the microwave system or if it came to him via transmissions or earth station. The cable system operators want to provide their audience with the signals they, the audience, want. One problem

that might arise would be where the PBS signal was transmitted on a VHF channel such that the cable's corresponding channel could not be used. In this case the cable TV operator with a full VHF signal selection, would have to have one less station available for customers.

All non-cable users in the community could be supplied a UHF signal so that with a moderate UHF antenna ($20 to $30) they too could receive the signal. The UHF signal could come from a 100 watt ar 1000 watt unmanned transmitter that would also provide a signal to the nearby rural area. The Montana PBS signal that is transmitted on the UHF could come from a microwave terminal, a cable connection, or an earth station. The signal to smaller communities might come via a UHF low-power transmitter and UHF repeaters.

If a VHF low-power transmitter would not interfere with the cable system nor any nearby translators, it could be used to serve the community and the nearby rural areas. However, the VHF transmitter location may be important. It should be located such that the same VHF antenna that is presently used at the residences will be able to see the PBS transmitter. Antenna rotators or VHF antennas are more costly than UHF antennas.

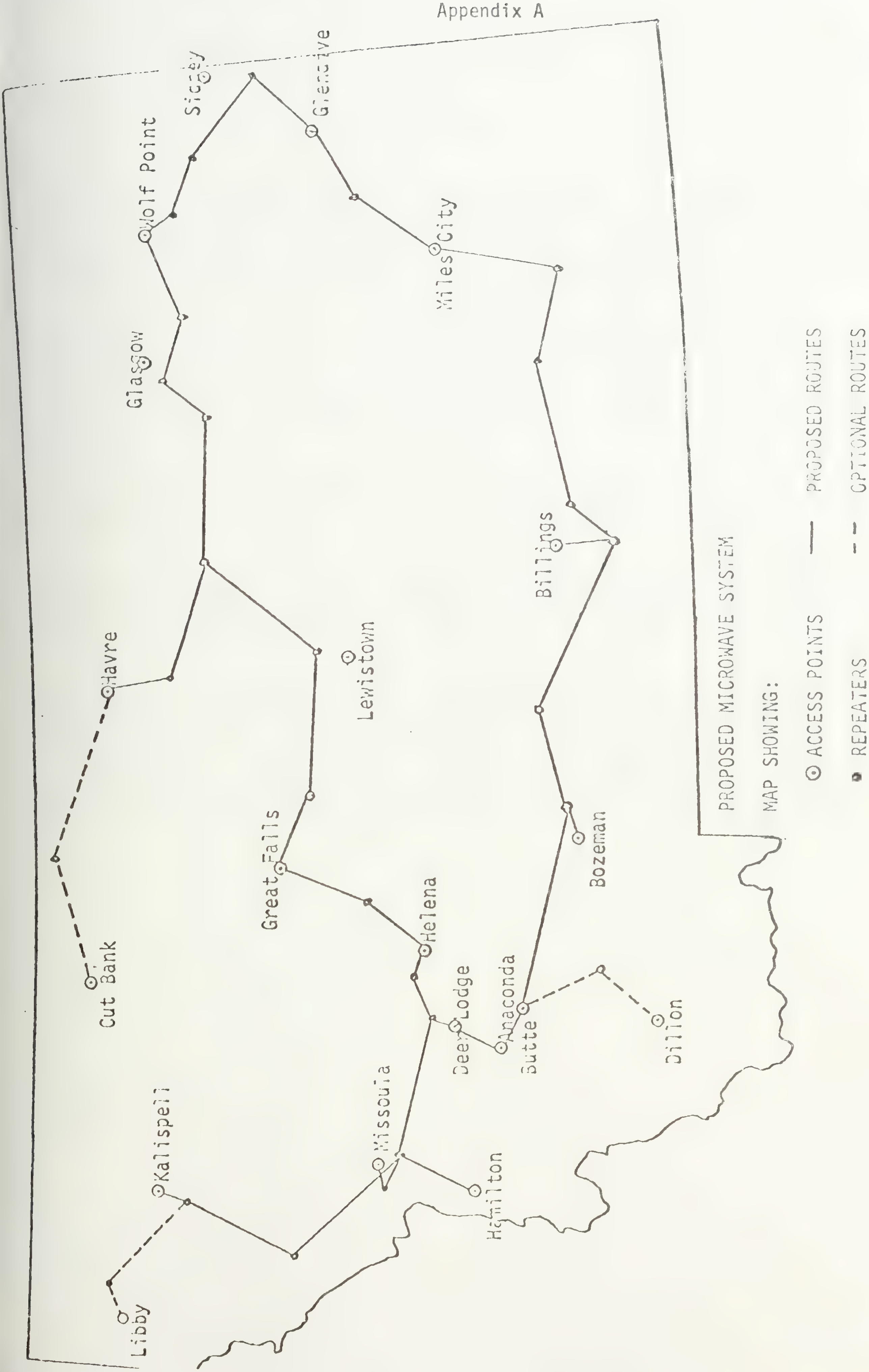
CONCLUDING REMARKS Several systems to deliver a Montana PBS signal to communities and then to households have been considered in this report. Some of the systems provide good coverage to cities but some work has to be done to get the signals to the rural areas. Other systems cover the whole state with equal ease. Some of the systems can be built a part at a time while others are almost a "do it all at once" project. Some of the systems can be used advantageously by local groups while with other systems this is not too easily done.

The state decision relative to PBS delivery systems should be based on the nature of the coverage of the state that is needed, a knowledge of what the people want the system to be able to do, and the money available. When these have been at least roughly determined, the two or three feasible methods of providing the service should be investigated in detail. This investigation should include a state design, a performance estimate, and a cost estimate for each system.

(1) McLeod, B.R. and March, D.N. , "Final Report, Montana State Communications System", Electronics Reasearch Laboratory Report #3373, Montana State University, December 31, 1973

(2) Formal request from the Universigy of Alaska Instructional Telecommunications Consortium to be granted membership affiliation and station status with the Public Broadcasting Service by William T. (Bill) McCaughan, Director, Media Services, University of Alaska Instructional Telecommunications Consortium, January 19, 1981

Appendix A


Libby
Kalispell
Cut Bank
Havre
Glasgow
Wolf Point
Sidney
Glendive
Miles City
Lewistown
Great Falls
Helena
Missoula
Hamilton
Deer Lodge
Anaconda
Butte
Dillon
Bozeman
Billings
PROPOSED MICROWAVE SYSTEM
MAP SHOWING:
ACCESS POINTS
REPEATERS
PROPOSED ROUTES
OPTIONAL ROUTES

Appendix B

The State of Alaska has established a system of "mini-TV" stations to serve small villages. Each mini-TV is equipped with a satellite earth terminal and a low-power transmitter. There are presently about 80 mini-TVs which carry a combination of commercial and public television programs which are received off-air in the Los Angeles area and retransmitted via satellite to Alaska.

The State of Alaska has committed funds to increase the number of mini-TV transmitters to 250, enough to provide service to every community of 25 people or more. The funding also includes establishment of an instructional service over a separate transponder to be picked up by the mini-TVs. It is this new instructional service for which the University of Alaska has requested permission to use PBS programs.

The new service is scheduled to begin in September 1981 by which time 120 of the mini-TV transmitters will be in place with the number increasing to 240 by the following year.

A consortium has been formed to operate the instructional service headed by the University of Alaska. The consortium consists of the Alaska State Department of Education, the Alaska Division of Telecommunications, and the University of Alaska Statewide System of Higher Education.

Sources of programs would be (1) instructional programs produced by the University of Alaska (which would also be made available to the PTV stations), (2) programs taken off-air form KAKM, the PTV station in Anchorage, and (3) PBS programs received at an earth terminal owned by the University of Alaska directly from Westar I. The University of Alaska would record these programs, arrange them into a unified broadcast schedule, and transmit them to an RCA Satcom satellite for pick up by the "mini-TVs".

msu

OFFICE OF THE VICE PRESIDENT FOR RESEARCH

RESEARCH AND DEVELOPMENT. TELEPHONE (406) 994-2891
GRANTS AND CONTRACTS. TELEPHONE (406) 994-2381

MONTANA STATE UNIVERSITY
BOZEMAN, 59717. TELEPHONE (406) 994-2891

GENERAL INFORMATION - MSU TERM PROJECT

The acronym TERM stands for "Telecommunications in Education and Research for Montana" and is the title of a telecommunications development project initiated by the Office of Research and Development at Montana State University. The TERM Project is designed to demonstrate alternatives to the costly energy and time consuming travel traditionally involved in the delivery of MSU's outreach programs in education, research, and public service.

Initial funding for the project has been provided primarily by two major grants. One is from the Department of Commerce, Public Telecommunications Facilities Program (PTFP), and is for television production and dissemination equipment in the amount of $245,000. The other major grant provides supplementary funds for program production in the amount of $86,000 for the first year of a two-year grant and is from the M. J. Murdock Charitable Trust, Vancouver, Wa. For both of these grants, John W. Jutila, Vice President for Research, is Principal Investigator; Carl J. Hoffman, Vice President for Extension/Director, Cooperative Extension Service, and Jack A. Hyyppa, Director Television Center, are Co-Principal Investigators; and Elizabeth L. Hurley, Administrative Officer, Office of Research and Development, is Project Coordinator.Related grants include a regional Community Learning Center Project funded by the Western Rural Development Center and the Montana Health Sciences Library Network Project funded by the National Library of Medicine.

The Telecommunications System

Under the TERM Project, MSU will produce and distribute color videotaped television programs for use in communities throughout the state. Programs that are generally informational or cultural will be offered to cable companies and broadcasters in the state for use as public service programming for home viewers. Programs of a more instructional nature will be used in group presentations, workshops, and seminars in the communities. The group presentations will be coordinated by local site facilitators. These programs may be used in conjunction with a live interactive audio component providing direct communication between the presentor of the videotaped program and a number of group presentation sites around the state simultaneously. Interactive data communications will also be available to supplement the audio and video components through the use of the Cooperative Extension Service's AGNET terminals.

Since 1979 the PTFP grant requirements have been expanded to include nonbroadcast entities as eligible applicants but the program does require access to an electronic means of dissemination. Technical arrangements for the distribution of MSU programs involve the use of the commercial microwave system owned by Western Microwave, Inc. Programs will be sent out over the microwave system late at night after regular programming has gone off the air. The programs will be taped in the communities on videotape recorders supplied by the grant and activated by tone decoders controlled by the MSU studio. The programs will then be available the next day for use on cable, for local broadcast, or for group presentations. Other communities not accessible by the microwave system will also be included in the network by simply mailing or busing tapes to them.

The cable companies involved in the initial phase of the project will be among those owned by Community Tele-Communications, Inc. that may wish to participate. Other cable companies in communities that can be accessed by the same microwave system will be included in the project as arrangements are made. Also, the programs will be offered to the independent cable companies and to the commercial broadcasters in the state who may be interested in carrying them as a public service. The PTFP grant provides for ten videotape recorders and tone decoders but additional communities could be accessed as well depending on the particular technical arrangements in each locality.

The interactive audio component of the system for use with the group presentation programs will be provided through the Educational Telecommunications System (ETS), a telephone teleconferencing system available under a cooperative arrangement with Eastern Montana College, Billings. The ETS will have 30 permanent installations around the state by mid-winter '81 and up to 20 portable units can be added to that system. The use of the ETS will provide private-line-quality voice communications between and among all of the sites involved in the group presentations and the instructor or program presentor. Consequently, videotapes of a program could be shown at a number of sites at an appointed time followed by live discussion and group participation.

The communities participating in the project will each have a community advisory committee which will deal with questions of local site selection for group presentations, program interests and needs assessments, program evaluation, local promotion, and the designation of site facilitators. The County Agents have indicated enthusiastic cooperation with the project and will serve as key representatives for the University. In some cases they may be asked to serve as site facilitators.

TERM Programs

Programs for the TERM Project will be produced at the MSU Television Center and the costs of production will be supplemented by the Murdock Trust grant. These funds will be available to faculty members and program leaders on a regrant basis. A Request for Proposals from the Office of Research and Development details the guidelines for project funding. The four general areas of program interest outlined in the Murdock grant are: health, education, research, and public service. Programs may be designed for general public viewing or group presentation or both. A wide variety of programs and program arrangements will be selected for inclusion in the project in order to expose as many people as possible to the uses of telecommunications in providing University outreach services.

Identifiable needs assessments will be important criteria in the selection of initial programs. Since the TERM Project simply offers an alternative mode of delivery to traditional outreach activities, programs designed to respond to clearly established community needs will be given priority in the initial phase. As the project grows and familiarity with the system and its potential is realized, more extensive community needs assessment mechanisms will be established. The system itself is essentially a tool designed to respond to user needs with whatever resources the University can provide.

Funding for TERM programs will continue to be developed through grant and contract activity, fees for services where appropriate, and general University support. It is anticipated that in a relatively short time the cost effectiveness of this approach in the distant delivery of services will not only prove the project to be self-sustaining but will provide substantial cost savings for many traditional areas of University activity.

ATTACHMENT J

UNIVERSITY OF ALASKA

INSTRUCTIONAL TELECOMMUNICATIONS CONSORTIUM (UAITC)

PERMISSION TO USE PTV SIGNAL TO MONTANA COMMUNITIES

Rob Mott

1 DENVER CO 05 JAN 81
L DLY JANE P. DEMMERT
IRECTOR, UAITC
NIVERSITY OF ALASKA
221 E. NORTHERN LIGHTS, SUITE 135
NCHORAGE, AK 99504

ROM: PUBLIC SERVICE SATELLITE CONSORTIUM
2480 W 26TH AVE SUITE 90B
DENVER, CO 80211
PHONE:(303)458-7273 TWX:910-931-2686
ANS:PSSCTG DVR

NAME: ROBERT A. MOTT
VICE PRESIDENT

DATE: 05 JANUARY 1981

): JANE P. DEMMERT
DIRECTOR, UAITC
UNIVERSITY OF ALASKA
2221 E. NORTHERN LIGHTS BLVD., SUITE 135
ANCHORAGE, AK 99504

AVE YOU IDENTIFIED TRANSPONDER FOR UAITC SERVICE?
ILL FOOTPRINT COVER MONTANA AND WYOMING?

EED RESPONSE BY JANUARY 9.

HANKS AND REGARDS.

OB MOTT

CCEPTED
)001

PC

SATCOM II TRANS II
UAITC

OFFICE MEMO

To Sharon

From Karen Karen

CC ✓Bob Mott

Subject Night Letter to Jane Demmert

Date January 16, 1981

Jane Demmert
Director, UAITC
University of Alaska
2221 E. Northern Lights
Suite 135
Anchorage, AK 99504

PSSC has completed technical study of coverage from Transponder Eleven, SATCOM Two in Montana and Wyoming. We find signal strength marginal but acceptable.

PSSC, CPB and rural communities in Montana and Wyoming filed FCC and PTFP applications for earth stations and low power transmitters to bring instructional and public television to eight unserved communities.

NTIA PTFP staff indicates funds for equipment and construction will be granted.

Critical requirement is availability of a non-commercial program service. UAITC service meets the requirements.

Request authorization to pick up F-2 Transponder Eleven at eight sites in rural Montana and Wyoming. Total population 75,900.

Memorandum of Understanding and other necessary agreements would be accomplished prior to start of service.

Appreciate return wire authorizing permission contingent on written agreement.

Thanks and regards.

Bob Mott

PUBLIC SERVICE SATELLITE CONSORTIUM

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olorado 80211 • (303) 456 7273
/X (PSSCTG DVR) 910 931-2686

BOB

January 16, 1981

Ms. Mary Dinota
NTIA/PTFP
1325 G. Street, N.W.
Washington, D.C. 20005

Dear Mary:

The Consortium is continuing its coordination role, in cooperation with the Corporation for Public Broadcasting, in behalf of rural communities in Montana and Wyoming. As you well know, the PSSC is coordinating both the PTFP Facilities applications and the FCC Construction applications.

Although there has been some attrition (Sundance, Wyoming, due to the arrival of cable and Mammoth Hot Springs, Wyoming and Baker, Montana because of financial considerations), seven communities continue to seek PTFP funds and FCC authorization to construct and operate small earth stations and low power transmitters to receive a non-commercial educational program service from one or more available sources.

This letter, is to inform you of the Consortium's continuing effort to obtain access to a program service.

Currently the Consortium staff is negotiating with the following organizations:

1. The Public Broadcasting Service
2. The Appalachian Community Service Network
3. The University of Utah
4. The State of Alaska

The status of the negotiation follows:

1. PBS
   A change in policy has occurred at PBS in regard to signal use direct from a satellite. Currently, the staff is studying new technology and will report prior to the end of February. Our understanding is that PBS is "encouraging" implementation of the Nevada

plan and may permit rural communities participating in the Nevada plan to access one or more PBS transponders. There is, however, a fundamental difference between the Nevada plan and the Montana-Wyoming applications. The Nevada plan incorporates an element of local program control. The PSSC scheme does not. We are hopeful that since PBS has introduced some flexibility into its policy, it may eventually grant full direct access.

2. ACSN
Access to this program service was granted in the second quarter of calendar 1980 and the rural communities agreed to accept this service. Since that time (April - June 1980), ACSN has negotiated program rights for several series for non-broadcast use only. ACSN has agreed that they will attempt a re-negotiation since their mandate includes service to rural isolated areas. At present, ACSN cannot provide an open circuit broadcast service.

3. UNIVERSITY OF UTAH
The licensee of KUED-TV would like to provide a direct satellite feed to rural areas of the western states including the communities applying for service in Montana and Wyoming. While KUED is philosophically committed to such a program service, it currently lacks the resources. We will continue discussions with KUED but do not envision that rural area program service will be available from this source in the near future.

4. UNIVERSITY OF ALASKA
Starting in mid-1981, the University of Alaska Instructional Television Consortium (UAITC) will initiate a complete instructional-public television service on SATCOM II, Transponder 11. The footprint of SATCOM II covers Montana and Wyoming. The PSSC began discussions in July, 1980 with the University of Alaska and the State of Alaska Department of Education to access their program service. Our request is under review.

This summary of our efforts to identify a direct feed program service may result in success and we request that this letter be made a part of the seven community applications now pending at PTFP.

We will keep you advised of our progress. Please let me know if more information would be helpful.

Sincerely,

John Paul Rossie
Planning Associate

cc: Dr. Young
Mr. Rubin, CPB
Mr. Mott

OFFICE MEMO

To Administrative Staff

From Bob Moffitt

CC John Rossie

Subject UAITC Program Access

Date 23 January 1981

Jane Demmert called today to advise that UAITC would be happy to grant program access for the seven rural sights in Wyoming and Montana.

A letter or agreement is to be negotiated.

Other problems and issues require resolution but we may have resolved the most difficult problem we faced.

RAM/dc

Attachment

. DLI JANE DEMMERT
IRECTOR, UAITC
IIVERSITY OF ALASKA
221 E. NORTHERN LIGHTS, SUITE 135
NCHORAGE, AK 99504

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ANS:PSSCIG DVR

NAME: ROBERT A. MOTT
VICE PRESIDENT

DATE: 16 JANUARY 1981

O: JANE DEMMERT
DIRECTOR, UAITC
UNIVERSITY OF ALASKA
2221 E. NORTHERN LIGHTS BLVD., SUITE 135
ANCHORAGE, AK 99504

SSC HAS COMPLETED TECHNICAL STUDY OF COVERAGE FROM
RANSPONDER ELEVEN, SATCOM TWO, IN MONTANA AND WYOMING.
E FIND SIGNAL STRENGTH MARGINAL BUT ACCEPTABLE.

SSC, CPB AND RURAL COMMUNITIES IN MONTANA AND WYOMING
ILED FCC AND PTFP APPLICATIONS FOR EARTH STATIONS AND
OW POWER TRANSMITTERS TO BRING INSTRUCTIONAL AND PUBLIC
ELEVISION TO EIGHT UNSERVED COMMUNITIES.

TIA PTFP STAFF INDICATES FUNDS FOR EQUIPMENT AND
CNSTRUCTION WILL BE GRANTED.

RITICAL REQUIREMENT IS AVAILABILITY OF A NON-COMMERCIAL
ROGRAM SERVICE. UAITC SERVICE MEETS THE REQUIREMENTS.

EQUEST AUTHORIZATION TO PICK UP F-2 TRANSPONDER ELEVEN
T EIGHT SITES IN RURAL MONTANA AND WYOMING. TOTAL
OPULATION 75,900.

EMORANDUM OF UNDERSTANDING AND OTHER NECESSARY
GREEMENTS WOULD BE ACCOMPLISHED PRIOR TO START OF
ERVICE.

PPRECIATE RETURN WIRE AUTHORIZING PERMISSION CONTINGENT
N WRITTEN AGREEMENT.

HANKS AND REGARDS.

OB MOTT

CCEPTED
0001

OFFICE MEMO

Rob F.

To File: Alaska

From E.Y.

CC Clipboard Routing

Subject Meeting with Alaska people at PTC

Date 30 January 1981

While attending the Pacific Telecommunications Conference in Honolulu, January 12-14, 1981, I met with several people from the State of Alaska. The following notes are from those visits.

1. Karen Perdue, Office of the Lt. Governor. Karen is on the Lt. Gov.'s staff. (According to Jennifer Wilke, the Lt. Gov. will succeed the present Governor in the next election unless there is a major political upheaval.) Karen indicated that they might want consultation in designing a teleconferencing studio. I indicated that we could provide that type of assistance. I asked that she send me a letter, briefly outlining what they have in mind. I have since sent her a letter reminding her of this conversation and enclosing some of our general literature. She also wanted copies of the footprints of all the existing domestic satellites. There are being collected and sent.

2. Jennifer Wilke, Dept. of Education. Jennifer, along with Jane Demmert, is a "co-principal" in guiding the satellite education efforts in the state. We had several conversations, including a lengthy one over dinner.

   a. Jennifer will send Polly Rash something for our Newsletter about the Alaska system. She is waiting for some other developments before drafting the press release and/or sending us information.

   b. Alaska will shortly disseminate an RFP for design of a management system to control their proposed satellite education network. While this may or may not be up PSSC's alley, Jennifer will send us a copy of the RFP.

   c. The question of granting program rights from their rebroadcast of PBS (and other) programs, e.g., for the rural stations in Montana and Wyoming, is being worked on. Their retransmission will be on SATCOM 2, Transponder #11. Jane Demmert is the contact person on this one. The final go-ahead will probably lie not just with the University of Alaska but with the coalition of educators.

   d. The Lt. Gov. is being groomed to succeed the present Gov. (See above.) Any work we do for the Lt. Gov. will give us a leg up on the future in Alaska.

e. The State of Alaska has had a planning grant from the NTIA PTFP program for 18 months but has not had state authority to spend the funds! However, authority should be granted soon. There may be some work for PSSC in the planning phase and Jennifer will let us know. (Recommend we check back periodically on this one.)

f. I reminded her again about our Denver facilities and the fact that we could become a "delay center" and/or retransmission facility. I also noted that the TFS is ready for use.

3. Sioux Plummer, Alaska Legislative Teleconferencing Network. Sioux attended dinner one night with other Alaska people and I was part of the group. No specific conversations except she radiated generally good vibrations about PSSC and would like to attend our next annual conference. In this connection, I told both Sioux and Jennifer that the next conference would likely feature user applications of communications satellites, and that the Alaska experience should be represented. They agreed. I think they would be willing to put on a session and/or participate in a session on applications.

4. Met with Bob Walp (formerly with State of Alaska and on PSSC Board, now running his own company in Alaska) and Stuart Browne (independent consultant and producer, formerly in Denver). No special notes but it was good to renew acquaintences.

Young and Mott to follow up on items noted above.

ey

Bob

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February 20, 1981

Jennifer L. Wilke
ITV Coordinator
Department of Education
State of Alaska
Pouch F
State Office Building
Juneau, Alaksa 99811

Dear Jennifer:

Thanks for sending us the RFP on ITV Program Channel Management procedures. We have reviewed it and determined that we will not respond. The RFP calls for skills not readily available from the Consortium staff. We believe you will have responses from others better qualified than we.

Had an excellent visit with Bill McCaughan yesterday. We will proceed, through his office, with the F-2 Transponder II test. A draft letter regarding access to the Alaska instructional/public program service is being proposed.

Your concerns regarding program negotiation and costs will be reflected. Bill was extremely helpful.

It appe rs that your work is going well but I sense it is very demanding. If we can help, please let us know.

Sincerely,

Bob

Robert A. Mott
Executive Vice President

RAM/dc

cc: Dr. Young
Dr. Bransford

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February 23, 1981

Mr. William T. McCaughan
Director, Media Services
University of Alaska
Instructional Telecommunications Consortium
2221 E. Northern Lights Blvd. #137
Anchorage, Alaska 99504

Dear Bill:

It was a pleasure to meet you last week and I appreciate the effort you made to stop at the PSSC on your quick trip around the country. I hope the rest of your journey was pleasant and of value.

The background letter describing the CPB/PSSC effort to bring public television to rural communities in Montana and Wyoming is enclosed as is the draft letter to John Cameron at NTIA/PTFP.

The materials requested by Francine Lastufka were dispatched February 20. She should have them by now. Let Polly Rash, our Director of Communications in Washington, know if supplemental material is needed.

I alerted the Operations staff in Denver that you expected to proceed with the community college event in May. They look forward to working with you.

Dail Ogden, Vice President for Operations, will work with you regarding the test on F-2, Transponder II. If you will call me with information regarding time for the test and related items, I will bring Dail into the loop. His staff in Denver will work with Alascom to conduct the test. It would help if the test can be done by March 10.

When we talked February 18, I neglected to mention that Jay Barton was elected to and has agreed to serve on the PSSC Board of Directors. The action was taken at the PSSC Board meeting in Denver February 12. We look forward to his participation.

I hope the background letter provides a perspective and that the draft letter can be transmitted to NTIA/PTFP.

We look forward to working with you.

Sincerely,

Robert A. Mott
Executive Vice President

RAM/dc

cc: Dr. Young
Mr. Ogden
Mr. Rubin, CPB

PUBLIC SERVICE SATELLITE CONSORTIUM

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3 March 1981

Mr. William T. McCaughan
Director, Media Services
University of Alaska
Instructional Telecommunications Consortium
2221 E. Northern Lights Blvd. #137
Anchorage, Alaska 99504

Dear Bill:

Since June, 1978, the Public Service Satellite Consortium (PSSC) and the Corporation for Public Broadcasting (CPB) have worked cooperatively to bring public television service to ten rural communities in Montana and Wyoming.

CPB commissioned the PSSC to study service for rural residents. With the Appalachian Regional Commission (ARC) as a sub-contractor, the work was conducted during the summer and fall of 1978. The report entitled, "Public Television Service in Rural America" concentrated on the Appalachian states, Montana and Wyoming, the only two states without licensed public television stations.

Findings were reviewed at a meeting held March 1, 1979. Representatives from Montana, Wyoming, NTIA/PTFP, FCC, National Translator Association, Department of Agriculture, NIE, PBS, NPR, CPB and the PSSC attended.

A consensus developed that steps should be taken to establish a process by which public television programming could be made available to unserved areas. The course of action called for the PSSC to identify communities in Montana and Wyoming that would file applications for PTFP grants for construction of small earth stations and low power transmitters. The PSSC would assist the communities in their preparation of the PTFP and the FCC applications. CPB provided financial support.

The PTFP program was transferred from the Department of Health, Education and Welfare to the newly created National Telecommunications and Information Administration in 1979. As a result, the application period was short. By deadline, ten community applications, seven in Montana and three in Wyoming, were filed with NTIA and the FCC.

For a variety of legitimate reasons, none of the ten applications was funded. (The ten applications were reviewed as a package).

PTFP staff, in co-ordinating the applications, recommended that the ten applications be resubmitted in Fiscal Year 1980. CPB agreed. PSSC consulted with leaders in the ten communities and all agreed to the re-filing. The applications were "fine tuned" and amended.

In January, 1980, the applications were resubmitted to the FCC and the PTFP. The review of applications proceeded during the first six months of 1980 and officials at NTIA/PTFP indicated that funds would be granted if the FCC approved the applications for the low power transmitters. (By this time television receive only (TVRO) earth stations had been deregulated). The PTFP staff raised one other substantial question: What program service would be delivered to the communities?

In the original application, PSSC identified several program sources and had obtained permission to rebroadcast the program schedule of KRMA-TV, Denver, Colorado. Thus, the application was technically in order but a significant practical question remained. Funds for purchasing transponder time and supporting related operational costs would have to be identified.

Permission to use KRMA's programming resolved the program rights problem but created the economic barrier. Leasing a transponder for delivery service to only ten locations was impractical.

The PSSC, though it is not a programming organization, began an effort to identify a source of programming that was delivered by satellite. At that time, PBS was the only such service. Negotiations with PBS were conducted over a period of six months. PSSC/CPB requested that PBS allow the communities to pick up the "basic" PBS feed. The local communities would simply receive and view the programs being transmitted on one of the three PBS transponders. In June, 1980, the PBS board of directors determined that, by granting access to the basic feed, the principle of local control would be violated.

The original PSSC study in 1978 had made clear that, so far as the residents of the communities were concerned, local control and/or local origination was not important. All ten communities expressed a willingness to receive the national service even though the feed might lack some elements of the service provided by a local station.

After PBS refused the PSSC/CPB request for access, PSSC turned to another program service, the Appalachian Community Service Network (ACSN). This organization, which was spun off from the Appalachian Regional Commission, was providing non-commercial daytime programs for local cable companies via SATCOM I.

The PSSC negotiation with ACSN was successful. NTIA/PTFP staff concurred that the ACSN service, while limited, would be acceptable. The ten communities agreed to accept the ACSN programs.

As the Consortium resolved the program access issue, another issue developed. In the Spring of 1980, the FCC had announced rule making on low power television transmission. A ruling was scheduled for July or August.

In June, 1980, PSSC was informed by FCC staff that approval of the ten low power transmitter applications just prior to action on a commission policy position could be viewed as prejudicial. The FCC staff reversed its position and declined to approve the ten.

The Consortium asked NTIA/PTFP to hold funds for the rural applications. There was some sentiment for doing so but there was concern regarding the timely release of funds to fully qualified applicants. NTIA/PTFP, opted to proceed and their grants were made on schedule.

The Commission ruled favorably on the low power question in mid-September, 1980, but NTIA had long since committed all available FY 1980 funds.

In September, 1980 PSSC again conferred with CPB and the rural communities to determine a course of action for FY 1981.

CPB insisted on continuing the effort and provided modest support to PSSC for the effort. The ten communities agreed to continue the program.

In the period October, 1980 to January 19, 1981, the FCC and PTFP applications were reviewed and revised. Construction costs were increased to meet the inflation factor. Two communities, Mammoth and Baker, Montana withdrew their applications for financial reasons. A third community, Sundance, Wyoming withdrew because a cable system was being constructed.

With concurrence and support from CPB, NTIA/PTFP and the FCC, the PSSC continued its search for a program service. Four possibilities were identified including UAITC, ACSN, PBS and KULD, the public television station in Salt Lake City, Utah.

The outcome:

UAITC. Access granted by Jane Demmert to Robert Mott via telephone on January 23, 1981. Negotiations continue.

ACSN. Emphasis now on delivery to CATV only. Has no plans to engage in open circuit broadcasting. Communities not enthusiastic about the ACSN service.

PBS. Study of rural service continuing. Some flexibility developing. PBS has given tentative approval to a rural delivery concept being developed by the University of Nevada, Reno. Issue of local determination and local control remains. PSSC reviewed the University of Nevada concept and agrees it meets the local control and origination requirement. After discussions with CPB, PSSC decided not to amend the applications. The capital and operating costs of the Nevada system are, in the view of PSSC, prohibitive.

KUED. Management of this station is committed to providing services to rural areas in the inter-mountain west. However, KUED is technically and economically unable to do so. While KUED may eventually be a provider, their resources (no uplink, no funds for transponder time) are not presently available.

The Consortium, in behalf of the residents of the seven communities who have applied to the FCC and the PTFP, request access to the University of Alaska Instructional Telecommunications Consortium program service on Transponder 11, Satcom eleven on or about August 1, 1981.

The communities include:

Sheridan TV Translator, Inc., Sheridan, WY	3,500
Circle TV Booster Club, Inc., Circle, MT	2,250
East Butte TV Club, Chester, MT	56,150
Meagher County TV District, White Sulphur Springs, MT	1,500
Powder River County TV Board, Broadus, MT	1,500
Roundup TV Tax District, Roundup, MT	4,000
Wolf Point TV Tax District, Wolf Point, MT	7,600
Total Population Served	76,500

A draft letter from UAITC to John Cameron, Administrator of the Public Telecommunications Facilities Program, is enclosed. It proposes access for a two year period initially with an option to renew. It is our view that by the latter half of 1983 a variety of instructional and public television services will be available for rural communities via satellite. Therefore, a long commitment is not sought. The requirement is simply for the UAITC to permit access and so advise NTIA/PTFP.

The draft letter does not address a concern raised regarding negotiation and payment for program series obtained from non-PBS sources, i.e., the Agency for Instructional Television, the Great Plains Instructional Television Library, etc.

The PSSC will advise the communities that they must cooperatively negotiate and obtain rights to such programs and series. Since all the community applicants are non-profit organizations with taxing authority they will be able to obtain the necessary funds. A central agency (Pacific Mountain Network in Denver has indicated its willingness to act as broker) would negotiate with program suppliers.

The Consortium will use its good offices and those of CPB (to the extent possible) to assist with the program negotiation issue. That effort should begin after the access permission letter has been sent to NTIA/PTFP.

If there are questions or if additional information is needed, please let me know. The Consortium has maintained files on this project. They are available if you need additional background or substantiation.

The UATC staff has been extremely cooperative and we appreciate the assistance and encouragement you have given us.

Sincerely,

Robert A. Mott
Executive Vice President

RAM/klh

enclosure

DRAFT

John Cameron
NTIA/PTFP
1325 G Street, N.W.
Washington, D.C. 20005

Dear Mr. Cameron:

The University of Alaska Instructional Telecommunications Consortium grants access to the program service which the UAITC will initiate on or about August 1, 1981 on Satcom II Transponder eleven.

Access is for a period of two years from the start of service with an option to extend the access for additional periods mutually agreeable to the participating communities and UAITC.

Access is granted to the following non-profit incorporated taxing districts:

Sheridan TV Translator Inc.	Sheridan, WY
Circle TV Booster Club, Inc.	Circle, MT
East Butte TV Club	Chester, MT
Meagher County TV District	White Sulphur Springs, MT
Powder River County TV Board	Broadus, MT
Roundup TV Tax District	Roundup, MT
Wolf Point TV Tax District	Wolf Point, MT

Sincerely,

PUBLIC SERVICE SATELLITE CONSORTIUM

IPAL OFFICE:
07
Street N.W.
ngton D.C. 20036 • (202) 331 1154
West 26th Avenue
Colorado 80211 • (303) 458 7273
TWX (PSSCTG DVR) 910 931 2686

250

PUBLIC RADIO

February 24, 1981

Elmo Sackett
Executive Director/General Manager
Alaska Public Television, Inc.
KAKM-TV
3211 Providence Drive
Anchorage, Alaska 99504

Dear Elmo:

It was good to talk with you last week. I contacted Nancy Griffin at WGBH re the feed of the Pope's visit in Anchorage. She was interested. I advised Dail Ogden of our Denver staff to complete arrangements. He indicated the bush format might cause some problems. I instructed him to put it in place if technically possible.

Had a good talk with Bill McCaughan of UAITC. I must say that your willingness to assist is matched by his attitude. It is nice to find some people who actually want to help.

We will proceed with the effort to bring the Alaska programming to Montana and Wyoming rural sites. I'll keep you posted as to the details.

The enclosed clipping from the Denver Post for February 13. may be of interest.

Thanks again for all your help.

Sincerely,

Bob

Robert A. Mott
Executive Vice President

RAM/dc

Enclosure

Wyoming Moves Step Closer to Public TV Network

CHEYENNE, Wyo. (AP) — A bill to bring Wyoming into the age of public television passed the Wyoming Senate by a better than 2-1 margin Thursday, despite more questions about potential cost.

The bill, which is similar to a measure that failed in the Senate two years ago, now goes to the House.

It would create a seven-member Wyoming Public Broadcasting Authority, which would use a $50,000 appropriation to plan for a statewide educational radio and television network.

The network could bring national public and educational programming into all parts of the state and could be used to originate educational and informational programming within Wyoming, sponsors said.

The bill passed (21-9) after surviving another blitz of questions and criticisms about the potential cost of the system.

"It's something the state should look at very closely," warned Sen. Tom Stroock, R-Casper, and Sen. Bob Frisby, R-Cody, saying creating the authority would be "opening Pandora's box."

But chief sponsor Roy Peck, R-Riverton, again stressed the cost would be up to the Legislature. Estimates of the cost have ranged up to $7 million, but Peck called that the "Cadillac System" and said the system would cost far less, by linking together existing towers, translators and commercial cable systems.

Another sponsor, Sen. Hight Proffit, D-Evanston, said most commercial cable systems have indicated a willingness to carry a Wyoming educational network if one is established.

Cable systems now carry educational television networks from surrounding states, with the exception of Montana, which is the only other state without a state public TV network.

PUBLIC RADIO

PUBLIC SERVICE SATELLITE CONSORTIUM

IPAL OFFICE.
907
Street N.W.
ngton D.C. 2003
West 26th Avenue
Colorado
TWX (PSSCTG DVR) 910 931

31 March 1981

Philip A. Rubin
Chief Scientist
Office of Science and Technology
Corporation for Public Broadcasting
1111 16th Street, N.W.
Washington, D.C. 20036

Dear Phil:

This is an iterim progress report on our work on the Montana Wyoming Rural PTV contract.

Contact has been maintained with the leaders in the seven rural communities, telecommunications leaders in Montana and Wyoming, NTIA, and the FCC.

The NTIA applications have been reviewed, updated and filed. Likewise, the FCC applications were reviewed, updated and filed.

We have been advised by the University of Alaska Instructional Telecommunications Consortium (UAITC) that permission will be granted to the seven communities to access the UAITC program service from F-2, Transponder 11 when the service is initiated in the fall 1981. A letter was mailed March 31 to John Cameron to confirm this arrangement.

Testing of F-2, Transponder 11 is required to insure an acceptable signal in Montana and Wyoming. PSSC will perform that test with Alascom but working through UAITC.

Task Two requires additional work. The ability and willingness of communities to pay for the program service has been discussed by UAITC, PSSC and some community leaders. We will follow up on this.

Assuming FCC approval and NTIA funding, service to the seven communities appears possible in the last quarter of 1981.

Please call me if additional information is required.

Sincerely,

Robert A. Mott
Executive Vice President

RAM/klh

cc: Dr. Young
Mr. Grossmiller
Mr. Rossie
Ms. Dinota, NTIA
Mr. Russo, Cohn and Marks

University of Alaska
Community Colleges, Rural Education and Extension
2221 E. Northern Lights Blvd., #137
Anchorage, Alaska 99504

March 31, 1981

John Cameron
NTIA/PTFP
1325 G. Street, N.W.
Washington, D.C. 20005

Dear Mr. Cameron:

The University of Alaska Instructional Telecommunications Consortium grants access to the program service which the UAITC will initiate on or about August 1, 1981 on Satcom II Transponder eleven.

Access is for a period of two years from the start of service with an option to extend the access for additional periods mutually agreeable to the participating communities and UAITC. Access is subject to those conditions agreed upon between UAITC and the PSSC negotiation on behalf of those communities specified.

Access is granted to the following non-profit incorporated taxing districts:

Sheridan TV Translator, Inc.	Sheridan, WY
Circle TV Booster Club, Inc.	Circle, MT
East Butte TV Club	Chester, MT
Meagher County TV District	White Sulphur Springs, MT
Powder River County TV Board	Broadus, MT
Roundup TV Tax District	Roundup, MT
Wolf Point TV Tax District	Wolf Point, MT

Sincerely,

William T. McCaughan

William T. McCaughan
Director, Media Services
University of Alaska
Instructional Telecommunications
Consortium

WTM/sms

cc: Jane Demmert, UAITC
Jennifer Wilke, DOE
Bob Mott, PSSC

ATTACHMENT K

PRELIMINARY TECHNICAL AND PROGRAMMING CONCEPT
FOR
THE DEVELOPMENT OF PUBLIC BROADCASTING
AND
TELECOMMUNICATION SERVICES FOR NORTHERN NEVADA

Prepared by: Office of Communications and Broadcasting
University of Nevada, Reno

Technical concept by Television Systems Services
555 Veterans Blvd.
Redwood City, CA 94063

TRODUCTION

iis paper presents a technical and organizational system that will bring iblic television and radio services to Northern Nevada. It is a system esigned by people who are deeply committed to the philosophy of public oadcasting and who believe that public telecommunications can provide aluable services to rural Nevada communities.

ne needs of Northern Nevada are unique. They are defined by the topography f the land and by the nature of the people who inhabit that land. Communities re located in valleys separated by rugged mountains. That is, Northern evada is a series of valleys running north to south at intervals of roughly 5 miles.

he total land mass is immense......92,000 square miles. Its population is 00,000. The major population centers, Reno, Sparks, Carson City, and ake Tahoe, comprise nearly two-thirds of that population. The remaining ne-third live in isolated rural communities.

he people who live in Northern Nevada are fiercely independent, and many ave chosen to avoid the confinement of the urban environment. Yet they are ot unlike the millions of people already benefiting from public broadcasting nd telecommunications services. They desire good entertainment, intelligent ocumentaries, and public affairs programs. They too want to learn, to row, and to be informed.

raditional means of bringing public broadcasting and communications to this opulation have failed. Centrally programmed, translator-based service has een rejected by Northern Nevada on three separate occasions over the past ifteen years. These attempts failed due to the very high costs of providing imited programming options. Another contributing factor was the absence f local control over communication services.

he technical system described herein, and the establishment of the Northern evada Network (NNN) comprised of individually licensed "mini-stations", ffers a viable means to provide Northern Nevada with its first locally ontrolled public telecommunications service.

TECHNICAL DESIGN

The objective of this section is to briefly define one possible technical method for disseminating public television and radio services in the Northern Nevada area. The method herein described is in idealized format; i.e., assumptions have been made to facilitate development of an overall concept without regard to constraints that may be imposed in the actual implementation of the concept. The intent of this document is to describe a starting point; considerable in-depth engineering, programming, and organizational considerations will require refinement in order to develop this concept into a detailed plan of implementation.

Design Objectives. The design objectives for a technical system to bring public broadcasting services to Northern Nevada include: defining a method for rapid high-quality dissemination of media transmissions to rural communities throughout Northern Nevada; designing a system that can be independently implemented in a relatively short time span in widely separated geographic areas; providing for considerable future expansion flexibility and growth in system uses; utilizing current technology and recent technological developments to guarantee a reasonable system life expectancy; minimizing day-to-day reliability problems; and most importantly, providing for long-term operational cost efficiency.

Satellite Delivery. A satellite method of media dissemination appears to be the most feasible and economical method for meeting the design objectives of this study. Each participating rural community (an estimated thirty in Northern Nevada) would be equipped with a satellite receiver and low-power broadcast transmitters. This combination of equipment (with ancillary items) would constitute an independent TV and FM educational mini-broadcast station. Each community would have an identical complement of equipment to facilitate assembly line construction of a professional equipment package at minimum cost and to reduce future maintenance costs and downtime by having common standby spares of equipment modules and uniform fault reporting equipment. Reception of signals into homes and businesses of the rural communities would be by conventional UHF/VHF television receivers and FM radio. The independent mini-station would be operated by a centrally located computer-managed remote control system to minimize operational costs and operational personnel. A two-way voice conference telephone network (already operational)

will be included at the mini-station site to assist in coordination of programming and to provide a feedback path for continuing education courses and special interest programming.

Mini-station Facilities. Each mini-station would consist of a weatherproof equipment module approximately seven feet wide by eight feet long by seven feet high and would contain all necessary electronic components required for operation of the mini-station such as remotely tunable (frequency agile) satellite receivers, monitoring equipment, low power broadcast transmitters (FM, TV and later ITV), random access remotely controlled color still picture source, remotely controlled video tape recorder (3/4-inch) and time base corrector, remotely programable eight-page character generator with color background generator, remotely controlled video/audio switcher, and remotely controlled audio cassette recorders. A microprocessor remote control system would simultaneously operate and monitor the above mentioned equipment.

The preceeding combination of equipment will allow, for example, the following sequence of events: reception of a PBS program from one transponder; dissolve to a locally generated Northern Nevada Network (NNN) ID slide with voice-over announcement; dissolve to a regional character generator message of upcoming events over a color background; dissolve to a local character generator presentation of local messages over a color background slide of the local community; dissolve to a mini-station ID slide with voice-over ID announcement; fade to black; cut to a prerecorded video cassette tape presentation; fade to black; present regional and local ID slides; and cut to a second PBS transponder for another PBS program (or occasional NNN program). This entire sequence of events would operate unattended at the mini-station site. he prerecorded video cassette may have been manually inserted in the cassette achine by a designated individual from the community or it may have been ransmitted to the remote site during the predawn hours when more occasional se time is available on the satellite transponders.

e equipment module would be constructed such that it can easily be installed the community site with a minimum of site preparation. It could easily be located if ever required and would be contained on a common support frame ld up by a number of cement piers. The tower supporting the TV and FM tenna would also be attached to the common support frame. The equipment dule would be environmentally controlled and would have standby power to erate the remote control system and FM transmitter during local emergencies.

small aperture satellite antenna would be constructed on a separate support me and would also be mounted on concrete piers.

mini-station enclosure and satellite receiver would be located in close ximity (within one mile) to the edge of a community to maximize efficiency operation with minimum radiated power. The anticipated power of the TV and transmitters would be 10 to 100 watts. The tower would be self-supporting not over forty feet in height. The satellite dish antenna would be five ers in diameter. The satellite receiver and low power broadcast transmitters ld be effectively shielded from other mini-stations by the mountain ranges rounding each community. A city-grade television signal would be provided r a typical community of 0.7 x 1.75 miles by means of a directional antenna.

tral Control Facility. The computer-managed central control facility for thirty or so mini-stations would be located in the Reno/Carson City area would be operated by the Northern Nevada Network. This control facility ld consist of satellite monitoring equipment, switching equipment, and puter-managed equipment to control and monitor up to forty future i-stations. This facility would require a maximum of two people to oversee operation while on-air. Computer control command signals would be sent to mini-stations by a satellite data channel; operational status would be eived back upon demand from each mini-station by conventional telephone e. Basic status and fault reporting facilities would be provided at each -station.

computerized central control facility would have the capability to remotely ram pages in the character generator at each rural mini-station. Several s in this rural character generator would also be programable from a local t such as the city offices, library, or selected home.

llite uplink facilities will be necessary at the control facility for o, audio, and control data. Interconnection to another uplink on a ed-time basis may be feasible. Initially, video tapes would be mailed to stablished uplink for regional programming.

ork Production Facilities. It is anticipated that at least one mobile uction unit, one post-production facility and one ENG unit will be ired initially. The production unit will be staffed by NNN personnel but be shared by mini-stations throughout the Northern Nevada region. This will be used to produce specials, cover local athletic events and produce nations throughout the region.

bile Production Unit will consist of three portable high-quality cameras, video switcher with special effects, monitoring equipment, gh band one-inch video tape recorders with editing, one time base corrector, sional character generator, intercom system and time code equipment. nit will be housed in a custom-built fifth wheel trailer pulled by a enger four-wheel drive pickup. The truck will contain an auxiliary power tor capable of operating the equipment where land power is not available.

RN NEVADA NETWORK/LOCAL RESPONSIBILITY AND CONTROL

ral community mini-stations would be licensed to the local community; anization of these individually licensed and locally controlled broad-tations would form the Northern Nevada Network (NNN). This network be responsible for providing operational, technical, and programming t for each member station.

etwork and mini-station concept provides many alternatives to each ity in cultural, educational, public affairs, local news, entertainment, formational programming. At the same time, it places full responsibility ntrol for programming with each rural community. Each community will how to exercise that control whether by means of a program council or m representative.

twork Staff will assume a leadership and advisory role in such areas as: ng and development, consortium program acquisition, engineering, production, ion, and fund raising. For example, the NNN Program Director would work ly with the community programming representative or council, providing ith a complete compilation of programming data, PBS transponder logs, c Mountain Network programming options, and a video tape catalogue so rogramming decisions can be finalized. This data would then be programmed he Network Computer which in turn would by remote control provide the ing at each mini-station.

MING

d NPR Programming. Initially we envision that the rural mini-stations pick up and re-broadcast the network PBS and NPR feeds directly from star I satellite in much the same manner any conventional PBS or NPR operates. This network raw feed from the satellite would be "cleaned provided continuity by means of the local signal sources available site (remotely controlled color slide, character generator, audio, and

tape sources). The resulting community broadcast signal would be sional and of high technical quality and would allow the local community ntify with both its local mini-station and regional network.

al NNN Programming. Regional programs would be transmitted to the rural by means of "occasional use" channels on the Westar I satellite. ms would be sent initially to existing uplinks by means of video tape d line microwave.

ample, an already identified program need is to provide a news and public s program specifically focusing on the issues and concerns of Northern ns. Currently many communities can only receive programming, commercial erwise, from the neighboring states of Utah, Idaho, and Oregon.

demand for this type of programming increases and additional occasional me becomes available, the NNN may own and operate its own video uplink.

lized Needs. Specialized programming could be sent to any selected ation of receiving communities (from one to thirty). The individual ity satellite receiver would be capable of switching (by remote control) n all channels (transponders) available on the satellite to receive rogramming. Adding future additional satellite receivers to the individual ity satellite antenna will allow simultaneous closed circuit transmission ividual communities without pre-empting the PBS programming.

ctional Broadcast Services. The proposed system will provide the means ch instructional broadcasting can be offered for the first time in rural communities. For example, in television, it is proposed to delay the PBS instructional feed automatically in each rural site and by ocessor control, retrieve the program segments in the order and at es they are desired. This will allow the local school to work around lunch, and special assemblies. In addition, teachers will have the to change the schedule each day to accomodate last minute schedule ts.

al service will be organized and run by a Northern Nevada Instructional ion Consortium. Decisions will be made by the local school districts number of hours, the services and series that will be offered. tion with the Las Vegas PBS station will allow the state to participate onal consortium buys for the first time.

i Education. Doctors, firemen, apprentice carpenters, teachers, mining s, law enforcement personnel, nurses, agricultural specialists, and

her professionals are moving to Northern Nevada. The rapidly expanding activities and the expected military (MX) development suggest that re adult learners will be inhabiting Nevada's remote areas.

posed system provides for significant flexibility in the delivery of onal programming to remote areas. The unique technical approach allows her broadcasting these educational programs to any or all of the ations, or "narrowcasting" to special groups. One example of such a ized service is to increase educational opportunities to the many Americans who now live in rural Nevada. As well, Nevada's Medical School lege of Agriculture, based in Reno, have a strong legislative mandate ide continuing education opportunities to professionals throughout the

versity of Nevada and Community Colleges already have many courses d specifically for rural Nevadans. It will be possible to offer courses, mple, to employees of a mining operation, providing two-way audio tive capability via the already operational telephone conferencing . The proposed concept makes possible the collaboration between rs and communicators in meeting the unique needs of Northern Nevada's adult learner population.

rigination. Most of the rural Northern Nevada communities have no adio, television, or newspaper coverage. The local origination ities of each mini-station could range from simply programming the er generator to live or taped coverage of local sports, news, town s, festivals, and rodeos.

mple, the character generator would be capable of being programmed e local community as well as from the regional central facility. remote portable terminals (electronic keyboards) could be provided community and located at such places as the police department or city at a designated home. The remote terminal would interconnect as d to the local mini-station by a conventional telephone. The telephone of the mini-station would be called and the telephone handset would be in an acoustical coupler connected to the electronic keyboard. The d message would then be transmitted to the character generator memory mini-station and the phone then "hung up". The mini-station would be d with an auto-answer phone device. This same device would be used ogram the audio cassette recorder from the central facility for voice-over l announcements.

mary purpose of the locally programmed character generator would be ide a means to directly communicate with the population of a small ty. Many communities visited as a part of this study presently have to accomplish this; i.e., there is no local radio station, television , or in some cases, no local newspapers. This character generator rovide the community calendars, news, and emergency announcements.

case of a local emergency, the emergency message could immediately be d" horizontally across on-going programming. The local fire siren e used to alert citizens to view their local PBS channel for this cy information. Several practical examples of typical emergency tion in a smaller community are as follows:

"Please do not water as one pump is out of operation"

"Fire is at Jones ranch four miles East of town"

"Interstate highway closed seven miles West of town due to weather conditions"

al character generator could also be used for announcing upcoming ty events such as school board meetings, rural fire department board s, community service club meetings, etc. This facility would constitute ctronic billboard" for the community.

of the larger community mini-stations will be equipped with radio and ion origination facilities such as carefully designed fixed-camera local ts and possibly a simple ENG news package. These facilities are proposed perated by high school, community college, or community group "clubs" in basic television production techniques by NNN personnel through ps and seminars.

NNN equipment and a skeleton crew of production people would be provided community on a rotating basis to cover several important local events either "live" or by video tape. Some of these originations might ied by other communities, the entire NNN, or nation-wide. These ity originations would be distributed initially by video tape and later s of a portable satellite uplink.

EXPANSION

ly, the mini-station programming would consist primarily of PBS and NPR ming and limited regional NNN and local originations. As the NNN ming needs grow, the satellite delivery system offers logical growth.

ually, a full-time NNN satellite channel and uplink may be required.

ional satellite receivers (frequency agile) can be added to the mini-station
lite antenna at any future time to provide simultaneous television
am reception. This would allow reception and re-transmission of a PBS
am by one receiver, and obtaining a special closed circuit program by
econd receiver. The second program would be distributed through the
ities of local cable companies in some communities or by the addition
2500 mHz transmitter and receivers in other communities.

ction equipment such as news cameras and radio production equipment
e added to each community as its needs and interests grow. This will
each community to determine the amount of local origination it desires
an produce.

ually it will be feasible to uplink data back from the rural community
This capability will allow sending still pictures, health care data,
omputer data back from the rural sites. This will complete the electronic
action between the rural community and the urban resources.

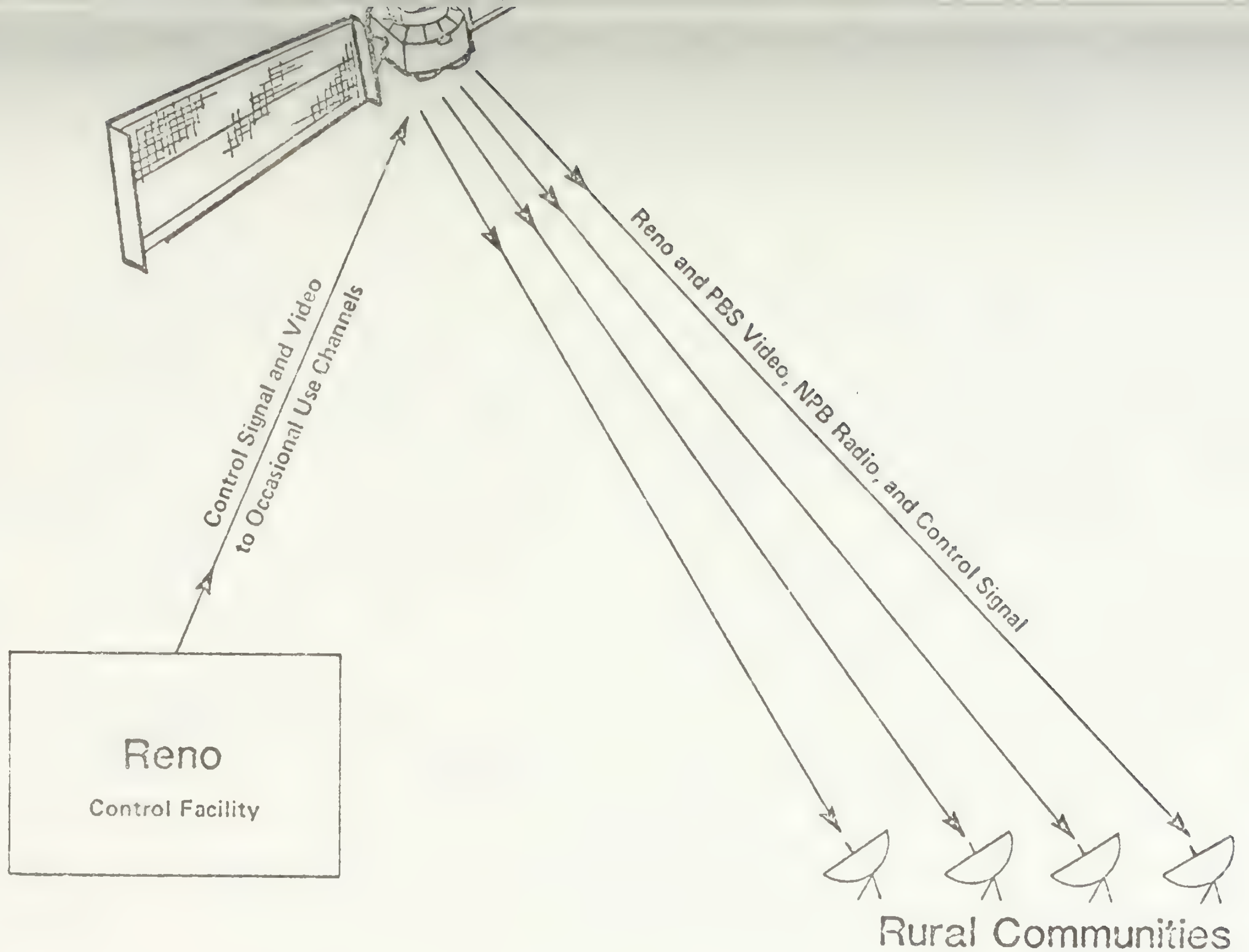
RY

ern Nevada presents a unique challenge to public broadcasters. The
of providing public television and radio services to rural Nevada by
ntional broadcasting is prohibitively high. A centrally controlled and
ammed translator system has been proposed and has been rejected.

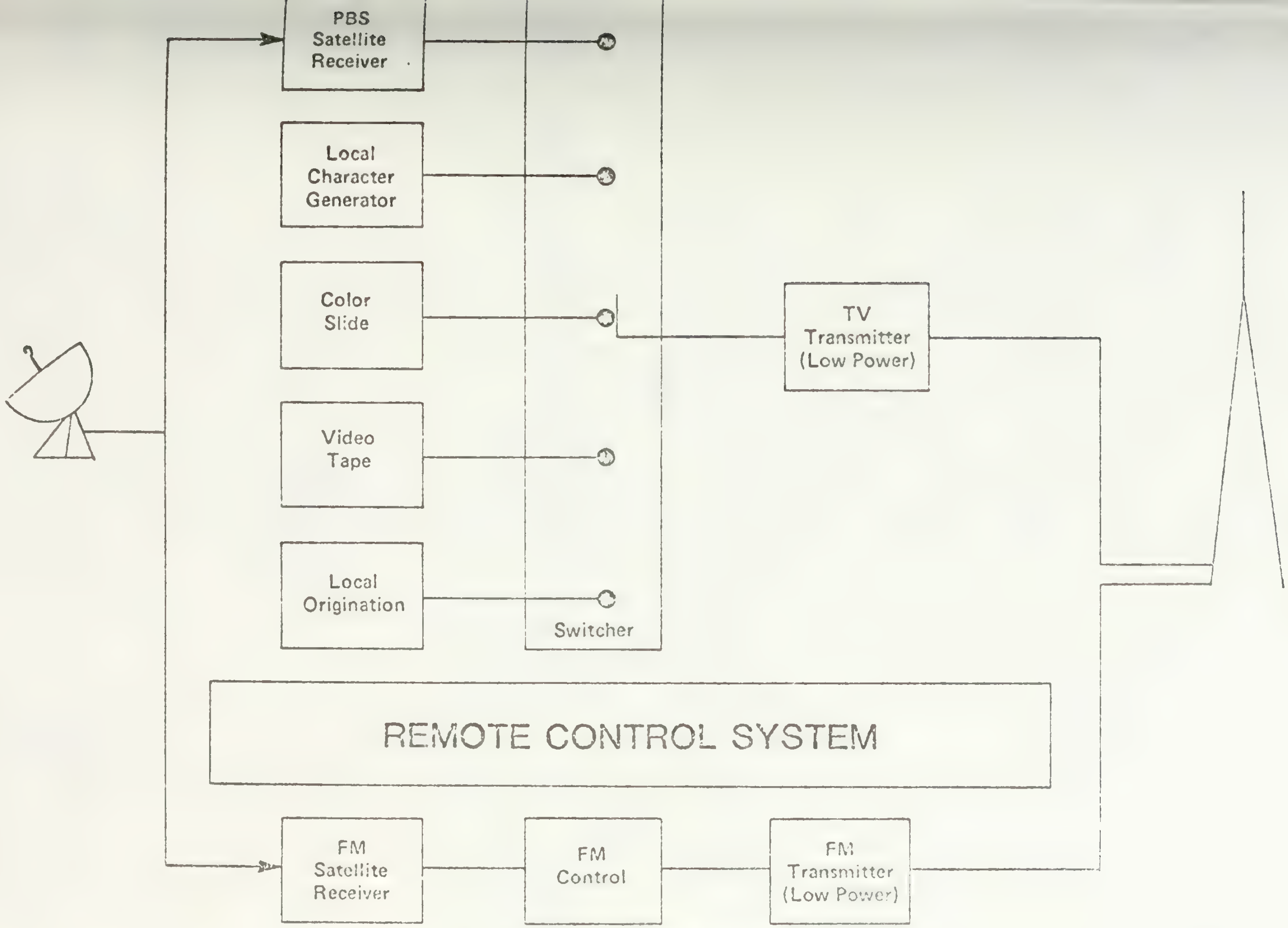
orthern Nevada Network and mini-station concept has been met with
siasm by Northern Nevadans. Adding to the impetus of this project is
mon desire within the public broadcasting and educational communities
tend services to unserved areas. Several organizations have advanced
to reach rural America. The FCC is reviewing regulations concerning
lators and low-power broadcast stations. NTIA's first funding priorities
o provide facilities which will bring the first public telecommunications
ces to unserved areas. The Carnegie Commission in A Public Trust strongly
rages the System to find a way to extend services even if that means
parture from our fundamental policies for broadcasting."

d, the proposed Northern Nevada Network and mini-station concept require
new ground be broken. The counsel and cooperation of public broadcasting
izations and government agencies is needed in order to refine and implement
roposed plan.

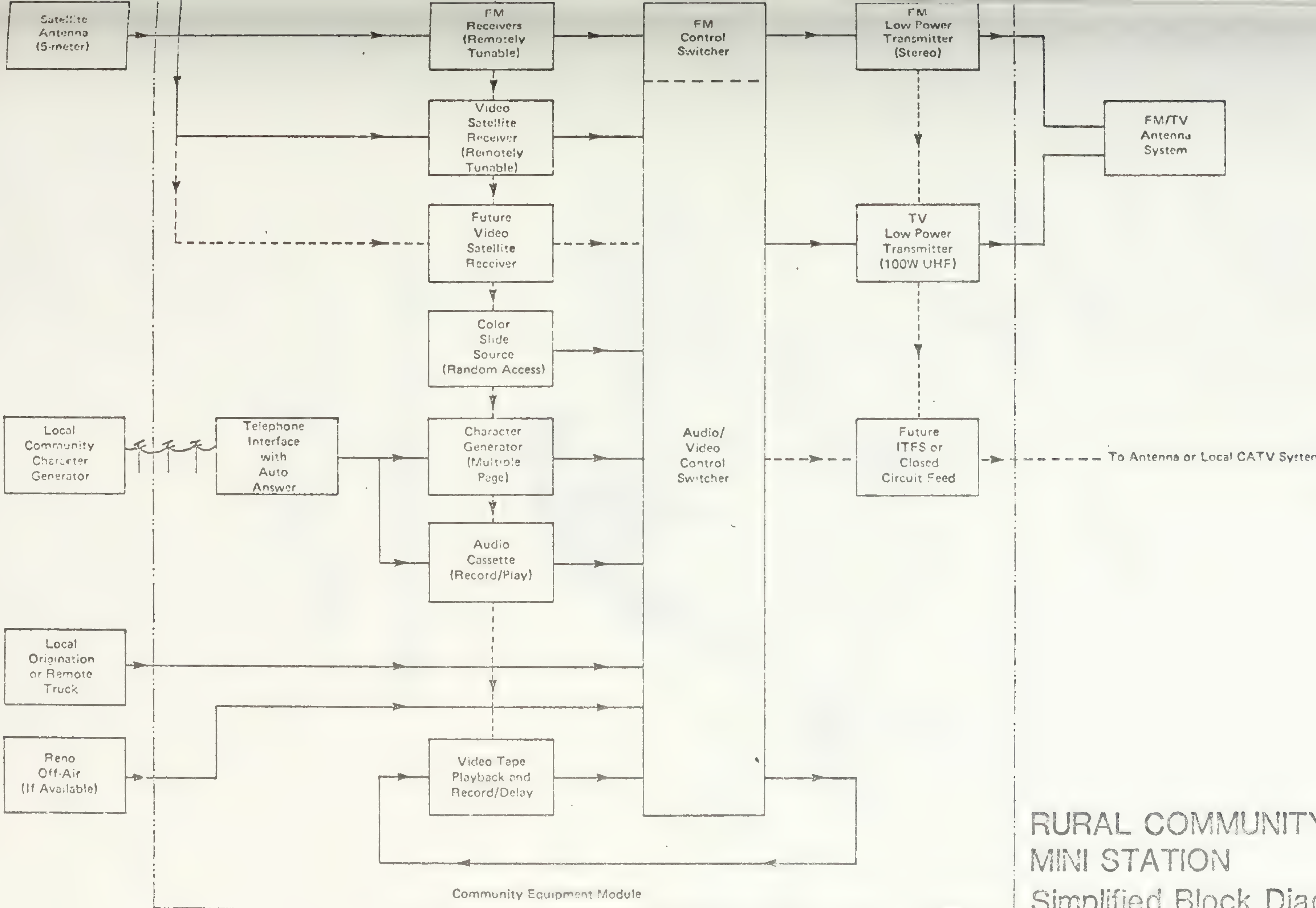
DRAWINGS TO ACCOMPANY TECHNICAL CONCEPT



RURAL SIGNAL DISTRIBUTION



RURAL COMMUNITY MINI STATION



RURAL COMMUNITY
MINI STATION
Simplified Block Diagram

Local Public Broadcasting Service for Nevada

Office of Communications and Broadcasting
University of Nevada • Reno
(702) 784-6083
Reno, Nevada 89557

University of Nevada · Reno
Office of Communications and Broadcasting
(702) 784-6083

PBS MINI-STATION COSTS AS PRELIMINARY ESTIMATES
December 12, 1980

Satellite receiver and antenna	$15,000
Character generator & remote control	7,000
Videotape recorder & time base corrector	15,000
Television transmitter & antenna	15,000
Remote control receiver & microprocessor	11,000
Equipment enclosure with tower & fence	10,000
System assembly & installation/miscellaneous hardware	12,000
Total:	$85,000

PUBLIC RADIO

SECTION VI

PUBLIC RADIO REPORT

by

MONTANA TELECOMMUNICATIONS PROJECT

August 1981

CONTENTS

1. EXECUTIVE SUMMARY

The Montana Telecommunications Project, in partial fulfillment of goals set forth in a National Telecommunications and Information Administration grant, has studied public radio in an effort to determine the technical alternatives available for distributing a signal to unserved areas of Montana and to determine rough costs for doing so. It is first important for the reader to understand what is meant by "public radio" in this report.

Any radio station which is non-commercial in its programming, which is at least partially funded with public money, and is associated with a public institution, is referred to in this report as a public radio station. This is so because it is presumed that a public radio study must consider which stations are, in fact, "public" - in the sense that a public radio policy might be applied to them. Also, continual differentiation between stations according to which programming sources they affiliate with is cumbersome in the extreme.

For those familiar with public radio, there may be a tendency to confuse the use of the term "public radio" in this report with National Public Radio (NPR). NPR is not a public radio station. It is a federally funded programming service which distributes its programming "feed" to affiliate stations. It is only one of many procedures of programming for public radio stations, many of which are not affiliated with NPR, but it is definitely the largest. When intending to refer to NPR this report will make specific reference, otherwise, public radio

is meant to mean non-commercial, publicly funded by Montana sources, and affiliated with a Montana public institution.

Public radio affords the population of this state an addition to the offerings of commercial radio. Commercial radio obviously meets a very important need, and this study does not pit one type of programming against the other. Instead, an effort is being made to determine how those people who do not currently receive public radio programming might be provided that service, from a technical standpoint.

It is important to note, at this point, some of the important features of public radio and how it differs from commercial radio.

Public radio is non-commercial radio. There are no advertisements or advertisers. The parameters for programming are very broad and ultimately allow a public radio station the opportunity to implement many innovative ideas.

The Federal Communications Commission - F.C.C. - permits public radio broadcast on both the amplitude modulated, or A.M., band and the frequency modulated, or F.M., band. A portion of the F.M. band is set aside for public radio in particular.

Because of the financial structure of the public radio system, monies for operations must come from the private sector in the form of donations; the government in the form of grants; or semi-public groups such as a student body. Some stations are associated with an educational facility and consequently receive budgeted public monies, at least in part.

In Montana, all public radio stations are affiliated with a college or vocational-technical school. Generally, the financial situation remains tenuous.

There currently exists a national public radio (NPR) service. Stations which affiliate with NPR receive a programming menue to choose from. There are specific criteria that must be met if a station is to gain affiliation or membership with NPR, which also lobbys for public radio.

The criteria for becoming a member of NPR are developed by the Corporation for Public Broadcasting, or C.P.B., which supplies money for N.P.R. member stations in the form of community service grants. N.P.R. may provide money for stations attempting to become N.P.R. members by issuing expansion grants. C.P.B. is a quasi-governmental agency which, for example, received 94.96% of its funds from legislative appropriations, 4.6% from interest income, .2% from grant refunds, and .25% from federal and non-federal grants and contracts in FY1980.

There are six public radio stations broadcasting in Montana. Of this number, only one is a member of N.P.R. while another is attempting to join.

There appear to be six different technical alternatives that could be employed when examining methods of increasing public radio coverage for either N.P.R. stations or non-N.P.R. stations:

1. Increase transmitter power

2. Increase the number of translators

3. Microwave distribution with local transmitter

4. "Hard wire" ties between stations

5. Bicycle of tapes from station to station

6. Use of satellite uplinks/downlinks

2. C.P.B. REQUIREMENTS FOR MEMBERSHIP IN N.P.R.

(1) Five full time, paid staff (minimum wage).

(2) One hundred thousand ($100,000) dollar annual income, non-federal support (N.F.F.S.). The amount will escalate by $5,000 per year until 1983 and by $10,000 per year after 1983.

(3) Sufficient power to cover applicable city (determined by engineering propagation study).

(4) Two separate control rooms and studios.

(5) On the air a minimum of 18 hours per day, 365 days per year. No commercials.

Source: Joanna Jacka, Station Service Associate, N.P.R., Washington, D.C.

No changes in requirements are under discussion or foreseen. (Alaska is inquiring about waivers of the above criteria).

In addition to membership status in NPR, there is an affiliation status upon which numerous states depend to build a public radio network based on a primary NPR programming feed.

Stations may elect two means of affiliating with NPR. First, any station may purchase non-timely taped programs for replay. Non-educational tapes cost about $12-$18 each, and educational tapes start at $6.

Secondly, any public radio station, as defined in this report, may sign an agreement with an NPR member station and NPR itself to acquire NPR feed from the local member station. The agreements required address copyright protections, program specifications (time limits for replay, live programming), and so on. The station affiliating with the local NPR member station is not required to meet the NPR membership criteria. Contributions made to the affiliated, non-member stations go to the local member station providing the feed; which results in greater community service grant funds to the member station from NPR. The states of Minnesota, Wisconsin, and W. Virginia have used this option to build statewide public radio networks affiliated with N.P.R.

(Source: Joanne Jacka, Station Service Assoc., National Public Radio, Washington, D.C.)

3. SUMMARY OF RESULTS OF PUBLIC RADIO SURVEY.

The following was analyzed and prepared by Dr. Rita Rice Flaningam of the Montana State University Department of Speech and Communication.

One aspect of the Telecommunications Project was a survey of public attitudes about public radio and television within the state of Montana. It was assumed that information gathered in such a survey would serve three functions: (1) help planners assess public understanding of the issues and technologies associated with the Project, (2) define the nature of access the public has to extant systems providing public broadcasting within the state, and (3) assess the

public's desire for such programming including methods of delivery, payment options and preferred program content.

To obtain the desired information a telephone survey and questionnaire were designed by members of the Project staff. Through the use of telephone company data nearly 1400 potential respondents to the questionnaire were randomly selected using available computer hardware and software. During early May interviewers employed by the Project called the selected individuals, indicated they were taking a public opinion survey on attitudes toward public radio and television in Montana, and invited them to participate. Those individuals who insisted on knowing more about who was conducting the survey were thanked for their time and the interview was terminated. (This was done to insure that people were not responding in terms of information they had about the Telecommunications Project.) The same practice was employed for individuals who indicated they were under 18 years of age as the survey director hoped to eliminate inaccurate answers.

Of the nearly 1400 individuals surveyed, 1296 gave responses complete enough to be analyzed. According to the demographic information provided by respondents, the survey team sampled a slightly atypical segment of the Montana population. (This generalization may be invalid as many people simply did not give certain information to the interviewers.)

Generally speaking the population sampled had the following characteristics:

(1) 87% lived in towns or cities (based on a response N of 809)

(2) 12% were aged 18 - 25

22% were aged 26 - 35

21% were aged 36 - 45

20% were aged 46 - 55

17% were aged 56 - 65

8% were 66 or older

(based on a response N of 694)

(3) 23% completed 8th grade or less

29% completed some high school

18% were high school graduates

17% had some college

13% were college graduates

(based on a response N of 782)

(4) 52% had incomes of $15,000 or less

30% had incomes of $15,001 - $25,000

11% had incomes of $25,001 - $35,000

39% had incomes of $35,001 - $45,000

39% had incomes of $45,001 or more

(based on a response N of 1146)

The variation in the amount of information individuals were willing to give about their age, education, income and family size

mitigated against analysis of responses of individuals in specific socio-economic categories.

A summary of the responses of the 1296 citizens follows.

Attitudes About Public Radio Programming

858 individuals (66%) reported having at least one operating radio in their home. Listening habits were examined and the largest group (24%) reported listening to the radio 1 - 5 hours per week. 21% reported listening 6 - 10 hours per week and 14% reported listening over 45 hours per week. (These data may reflect individual use of car receivers.)

One quarter of the subjects did not know whether they could receive public radio - 38% said they could, 37% said they could not. Those receiving public radio were generally pleased with its quality - 68% find it satisfactory. But only 7% donate money to a public radio station. Twenty-one donate $100 or less, two donate $201 - $300 and one donates $401 - $500.

Listeners were questioned about the type of programming they prefer. When asked to indicate the types or programming they would like to receive they indicated:

(1) Programming now available

(2) Don't know

(3) More National Programming

(4) More Montana Originated Programming

Their preference for Montana Programming were:

(1) Montana History and Culture

(2) Local Issues and Politics

(3) Radio Theatre

(4) State Issues and Politics

(5) Montana Legislature

(6) Outdoor and Recreational

(7) High School Sports

(8) College Sports

(9) Professional Sports

(10) Religious Programming

All subjects were questioned about funding and delivery options for public radio. As with television the majority favored a combination of state-local district funding. Their choices in descending order were:

(1) Combined state-local district funding (47%)

(2) No funding (22%)

(3) Local district funding (11%)

(4) State funding only (10%)

(5) Federal funding (9%)

Interviewers explained to the subjects that public radio stations are independently funded and operated and asked whether they thought the various stations ought to be made into a network. Responses were evenly divided - 32% said yes, 37% said no and 31% had no opinion.

Some Conclusions

The data collected in the survey are most valuable and fulfill its intended functions. Although the preceding lists will be most valuable some generalizations may be made.

Individuals addressing potential programming options in the State should find most useful the lists of individuals' preferences for programming types. Although Montana oriented programming was not the primary choice of consumers and potential consumers we do have a good list of program types that would probably attract a substantial audience.

A general lack of information and understanding about public media funding options and technologies seems to prevail. Areas in which the public must be better informed if they are to support telecommunications growth in the State are:

(1) What constitutes public programming as opposed to commercial programming,

(2) The nature and implications of various delivery technologies and options - e.g. satellite systems and networks,

(3) The nature and implications of various funding options - e.g. funding districts,

(4) The range of program content available on both public radio and television,

(5) The status of public radio and television in Montana - what is really available, and

(6) The potential for these media in the future and how that relates to them on an individual basis.

It is hoped that this information will be useful to Project planners and the survey team is to be congratulated on a job well done.

This survey was taken within the context of "public radio" as explained in the reports opening remarks in order to maximize its utility and application.

4. PUBLIC RADIO STATIONS IN MONTANA TODAY

STATION	FREQUENCY	LOCATION	POWER	LICENSEE
KUFM	89.1	Missoula	18.5 kw	University of Montana, Radio-TV Department
KUFM	99.3	*Butte	10 w	University of Montana
KUFM	90.7	*Helena	10 w	Helena Public Radio Association
KUFM	107.1	*Marysville	10 w	University of Montana
KEMC	91.7	Billings	24.5 kw	Eastern Montana College
KNOG	90.1	Havre	10 w	Associated Students, NMC
KMSM	91.5	Butte	50 w	Associated Students, Montana Tech
KGLT	91.9	Bozeman	2000 w	Associated Students, MSU
KHTC	88.5	Helena	10 w	Helena Vocational Technical School

*Translator Sites

OVERVIEW OF THE NON-COMMERCIAL

STATIONS IN MONTANA

STATION	NPR MEMBER	FINANCING	PROGRAMMING	LENGTH OF OPERATION
KUFM	yes	NPR donations and U.of M.	NPR + Local	18 hrs/day 365 days/yr
KEMC	no (applying)	Donations	Classical	2:00PM-1:00AM 365 days/yr
KNOG	no	Student funded	Musical variety	6:00AM-2:00PM 4:00PM-12:00AM School year
KMSM	no	Student funded	Musical variety	3:00PM-12:00AM School year
KGLT	no	Student funded	Musical variety and non-musical	6:00AM-2:00AM 365 days/yr
KHTC	no	School funded	Easy listening music	7:00AM-10:00PM School year

CURRENT POPULATION COVERAGE*

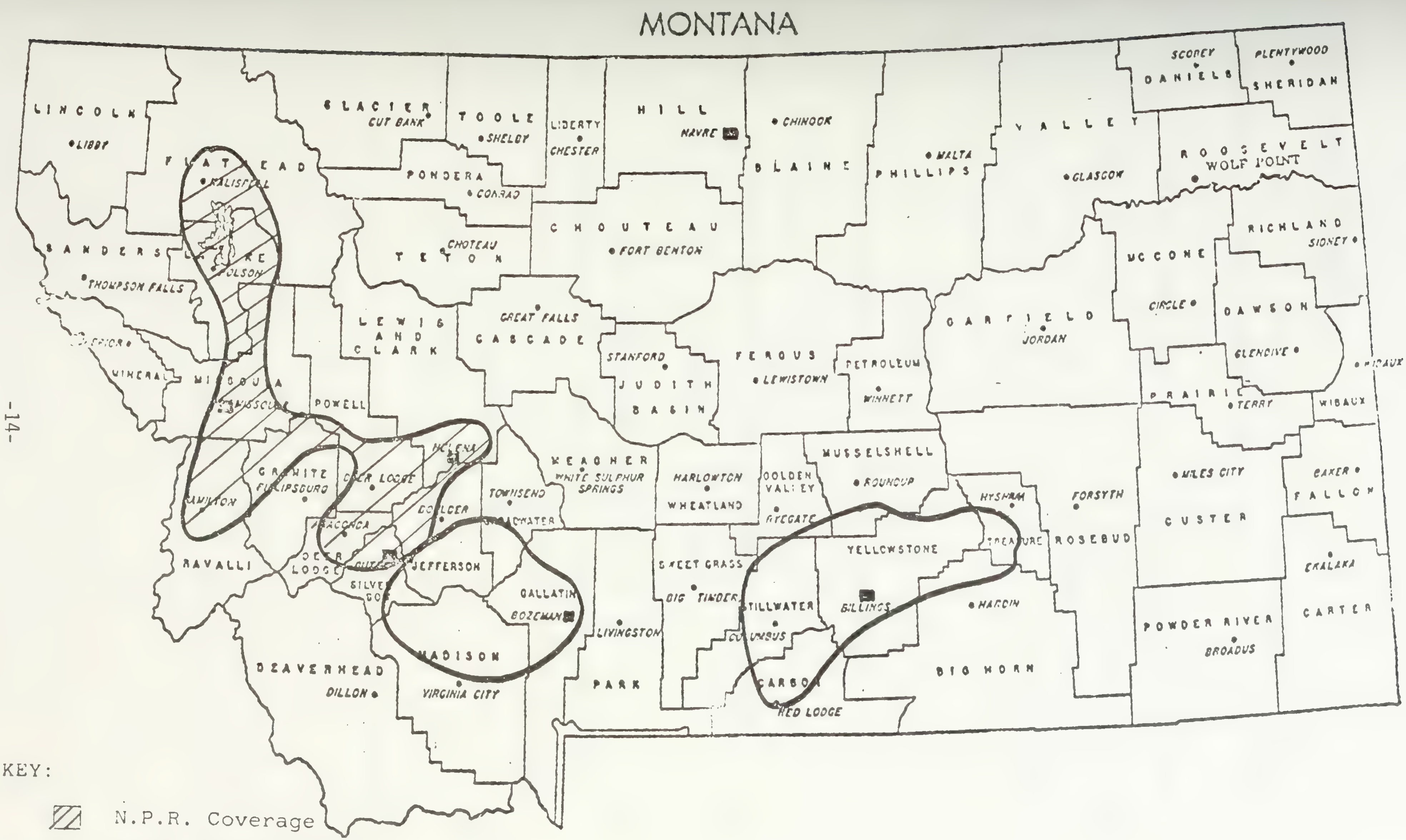
STATION	POPULATION COVERAGE
KUFM	220,000
KEMC	120,000
KGLT	70,000
KNOG	15,000
TOTAL	425,000 = 54% of 1980 Population

NOTE: Stations KHTC (40,000) and KMSM (35,000), are located in the coverage area of KUFM, and have, therefore, not been listed separately to avoid misrepresenting the total population covered. It is not safe to assume, however, that the listening audience is the same.

Total population of Montana - 786,000 (1980 Census).

*Figures provided by Stations.

CURRENT PUBLIC RADIO COVERAGE



KEY:

N.P.R. Coverage

Public Radio Station

Areas Covered by Public Radio Stations

5. TECHNICAL ALTERNATIVES

As noted in the executive summary, there are six alternatives to be examined when looking at public radio:

1. Increase Transmitter Power - This system would be something to consider if Montana didn't have such mountainous terrain. Because the F.M. signal travels line of sight, no amount of power will beam the signal through a mountain or hill, thus making reception impossible if there is intervening terrain.

Even in eastern Montana, where the land is relatively flat, there is still enough geographical variation to prevent 100% signal propagation.

The uncertainties of geography lead those in the field to conclude it is even difficult, if not impossible, to determine what magnitude of transmitter could be most efficiently used.

2. Increase the number of translators - Due to Montana's topography, translators are one means by which an F.M. signal can be widely distributed. Translators are installed on strategic points - mountain tops - and used to beam the F.M. signal from a main transmitter into a specific area, or from translator to translator.

This is occurring in the broadcasting of the KUFM signal to the cities of Helena, Butte, and the village of Marysville.

As the signal is passed from the transmitter to the translator, some "spill" of the signal occurs along the route allowing those people

in this path the opportunity to pick it up.

3. Microwave distribution with local transmitter - In using this system, the F.M. signal is carried by microwave from an originated transmitter to a transmitter located at the termination point. The system is the same as the transmitter-to-translator method except that signal distribution is by microwave between orignating transmitter and translator. It is also to provide other stations with N.P.R. feed which may then be retransmitted. Such a system requires an agreement with the N.P.R. and the N.P.R. member station. Other states (Wisconsin, W. Virginia) have built state-wide networks in such a manner.

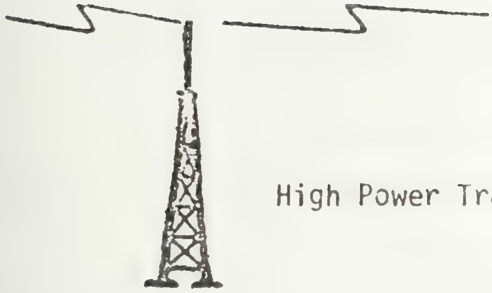
4. Hard wire ties between stations - This system employees a telephone link between the originating station and the station being served. The radio signal is carried over a telephone line.

5. Bicycle of tapes from station to station - Pre-recorded tapes of any type of programming are sent from the originating station to the "receiving" station.

6. Use of satellite uplinks/downlinks - involves lease of a satellite audio channel or use of an existing satellite signal. An uplink capability would permit the transmission of a signal to a satellite. The signal returning from the satellite would be received anywhere within the "footprint" (area covered) of the satellite. Uplinks may be purchased or leased (lease would require the cost of transmitting the signal

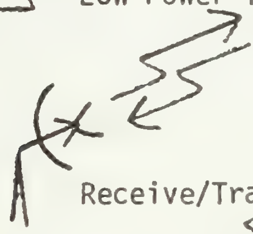
from Montana to Seattle for uplink transmission).

The existing NPR satellite signal is not formatted for direct rebroadcast, as by a low power transmitter off a receive only antenna dish. Formatting, scheduling, and fill-in by a member station is required by NPR.

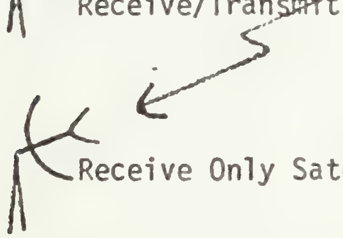


High Power Transmitter

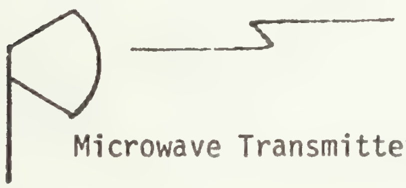
Low Power Transmitter or Translator



Receive/Transmit Satellite Earth Antenna



Receive Only Satellite Earth Antenna

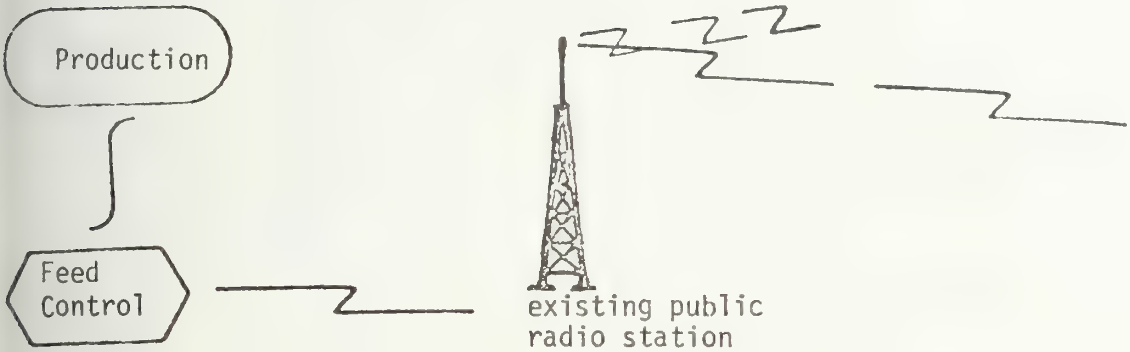


Microwave Transmitter/Receiver/Repeater

GEN. NEEDS ASSESS.

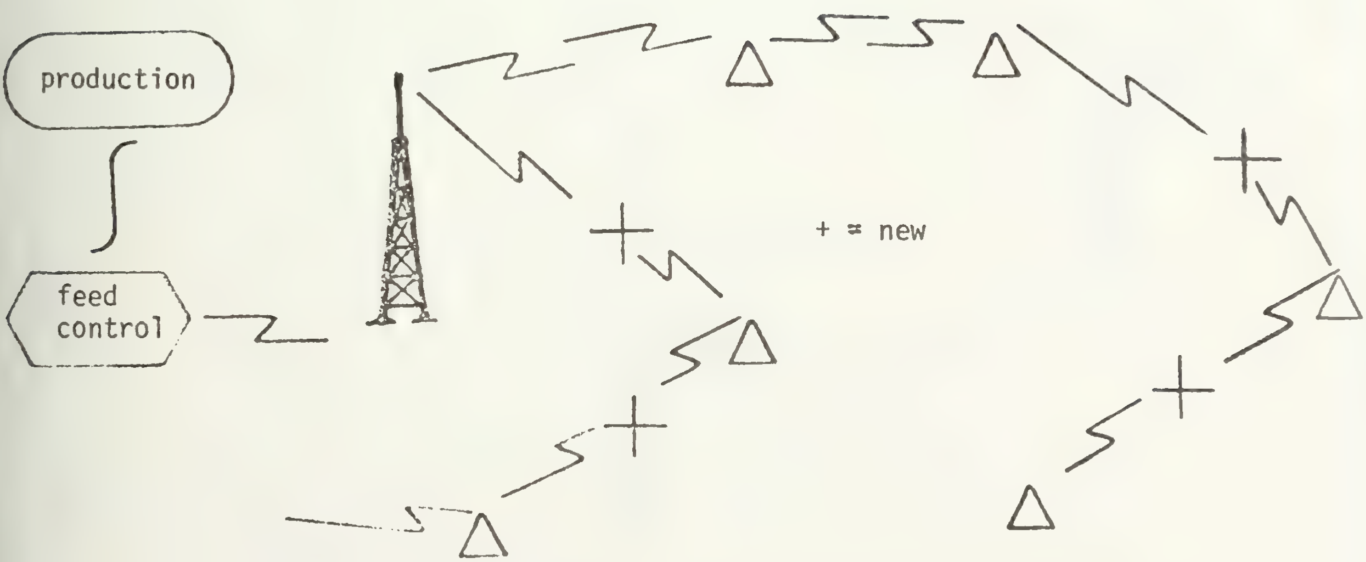
SCHEMATICS OF PUBLIC RADIO ALTERNATIVES IN MONTANA

1. INCREASE TRANSMITTER POWER



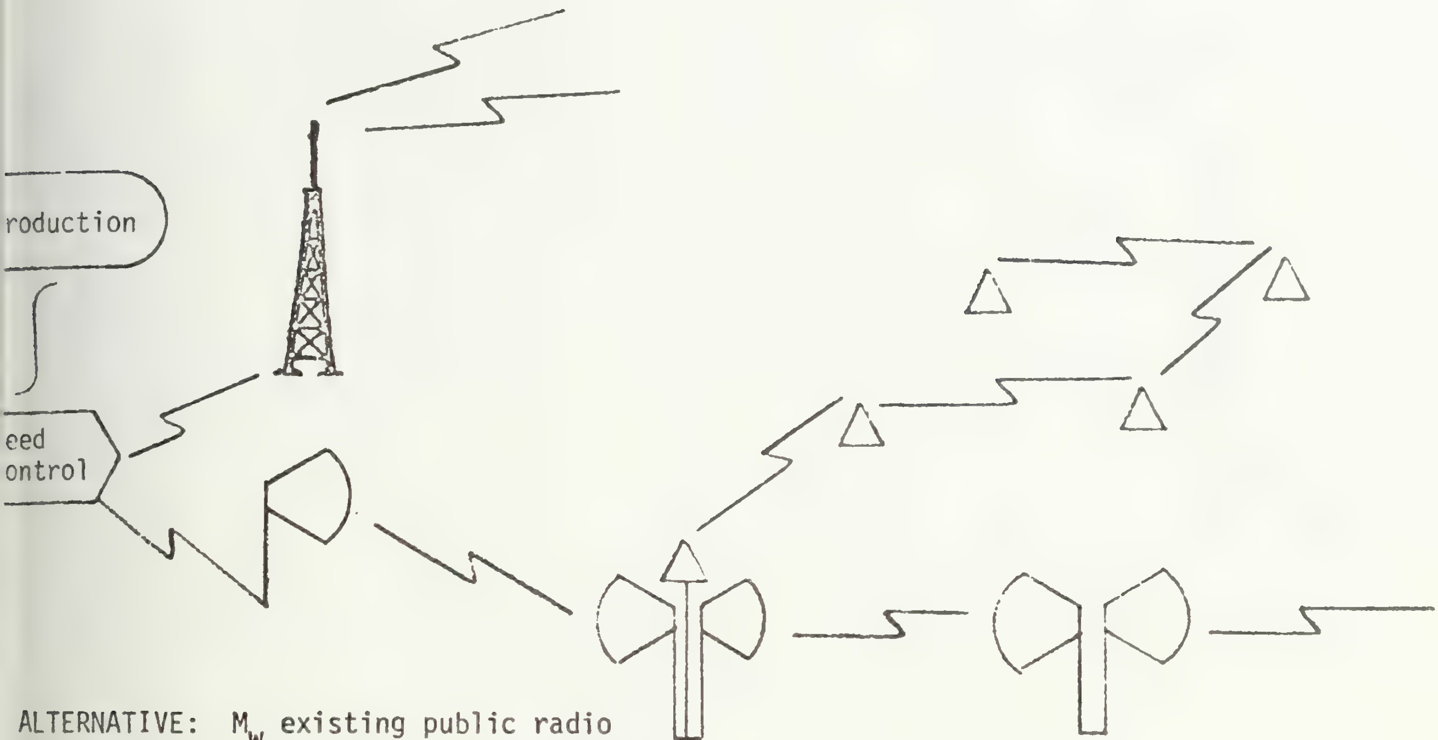
ALTERNATIVE: Increase geographical coverage by by increasing effective radiated power of transmitters.

2. INCREASE TRANSLATOR SYSTEM



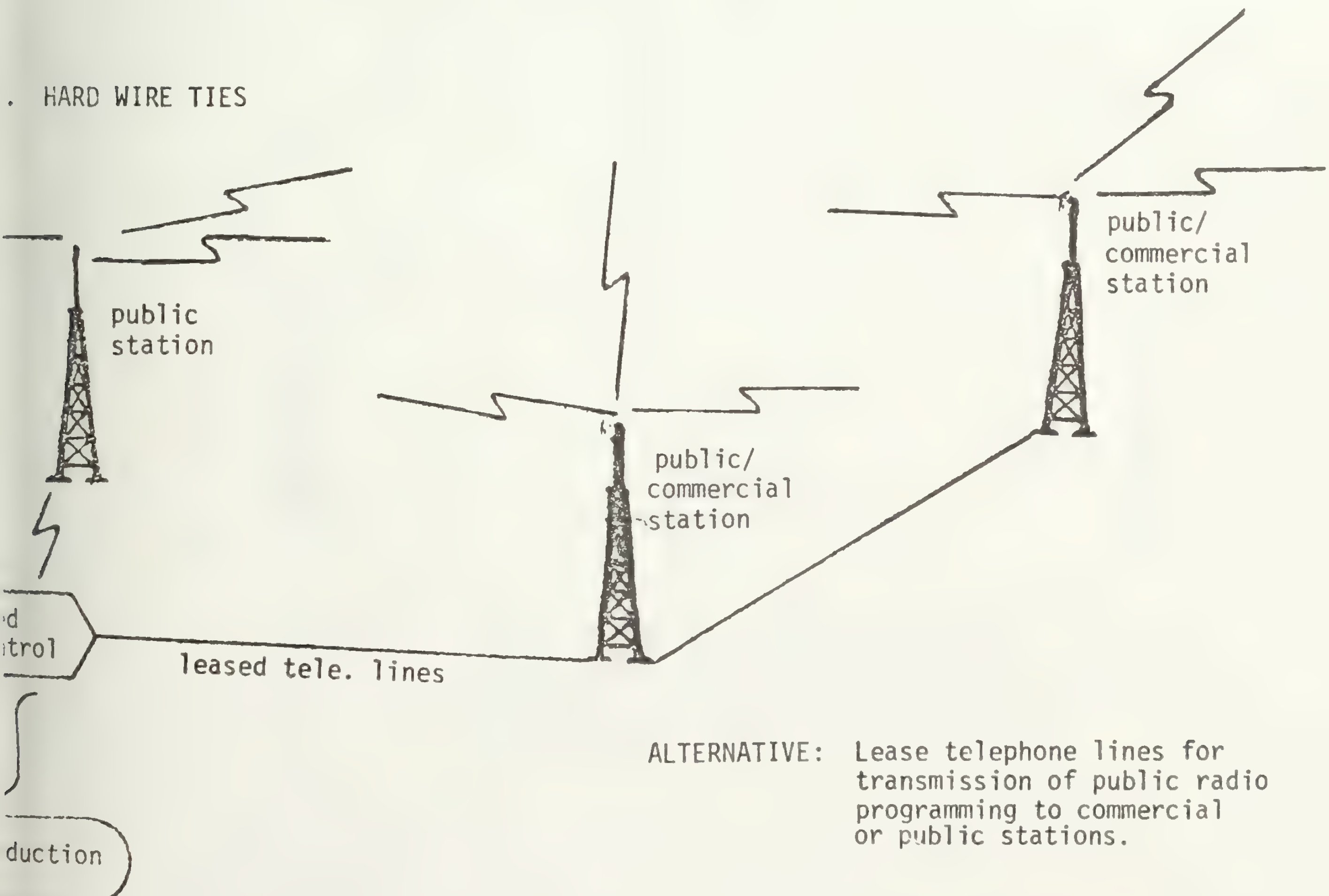
ALTERNATIVE: Increase geographical coverage by increasing the number of translators.

. MICROWAVE/TRANSLATOR SYSTEM



ALTERNATIVE: M_w existing public radio programming from originating stations to low power transmitters and extend such coverage with added translators.

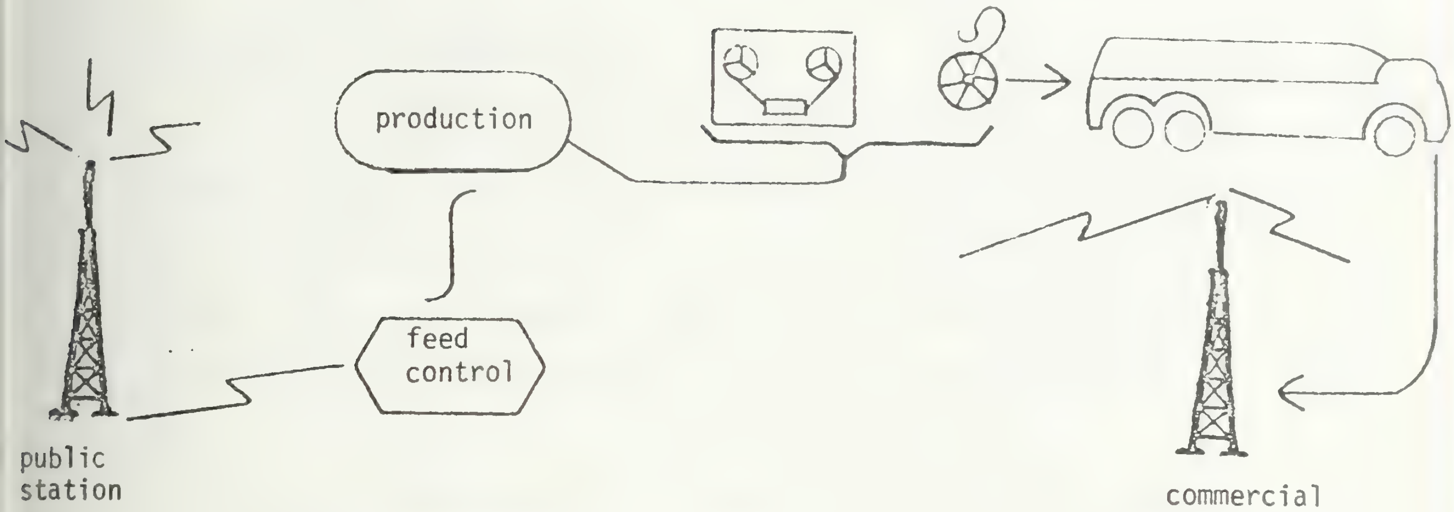
. HARD WIRE TIES



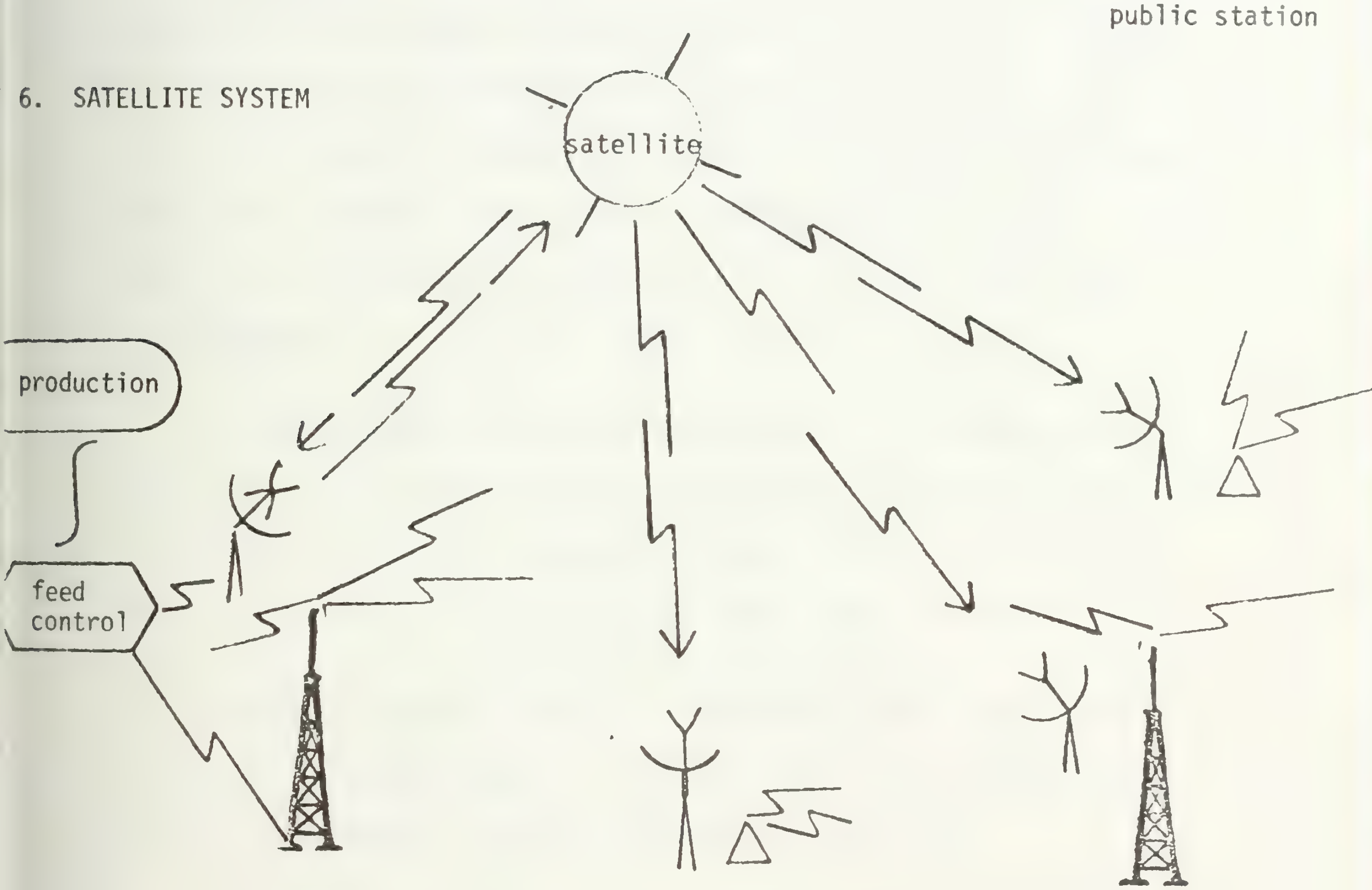
ALTERNATIVE: Lease telephone lines for transmission of public radio programming to commercial or public stations.

5. BICYCLE TAPES

ALTERNATIVE: Public stations send program tapes to other commercial or public stations.



6. SATELLITE SYSTEM



ALTERNATIVE: Lease satellite transponder and receive signal with series of earth antenna with transmitters attached. Same system can be used without a state owned satellite link by buying Nat'l Public Radio feed.

6. ADMINISTRATIVE ALTERNATIVES

In the case of the preceeding six technical alternatives, most require some form of approval from the F.C.C. in the form of permits for: construction of translators and transmitters; increase in transmission power; uplink/downlink connections; or using hard wire ties. Technical option 5 has, however, special administrative problems that must be reviewed:

Option 5 - bicycle of tapes between N.P.R. stations and other stations has some legal problems associated with it. Due to copyright laws and the payment of royalties to producing organizations, N.P.R. had difficulties with regulations regarding the transmittal of tapes from their stations. N.P.R. pays the stipulated royalties and, therefore, feels they are within their rights to hold tapes back from distribution.

The Concert Music Broadcasters Association is now demanding, via a resolution, that the N.P.R. be required to send those tapes they don't want to air to commercial stations that do want to air them. As a result, the situation presently remains resolved.

Option 3 - Once the signal is carried over the microwave unit from the origination station, it can be retransmitted at the terminal point. This system allows local programming insertion.

Great Falls could install a transmitter only for about $25,000 by delivering the signal via microwave, using reconditioned equipment

and free use of the Montana Television Network's building, tower, and microwave system. [1]

Local program insertion at the Great Falls site could be accomplished at various levels. A modest news and public affairs insertion capability would be possible for about $4,000.[2] A "packaged" program production capability would probably cost in excess of $10,000.[3]

By using seven or eight translators receiving the signal from the Great Falls transmitter, most of central Montana could probably be covered (including Havre). This system would then be disseminating N.P.R. programming to most of western and central Montana.

Due to the very high cost of hard wire ties, and the great distances in Montana, it would not be feasible. Further, the appropriateness of the series 6000 Type 6153 lines available is questionable.

Due to the fact that bicycling of tapes remains in a legal state of limbo, it is difficult to determine how effective or feasible the system is.

The costs are prohibitive when examining the use of a satellite. However, because there are so many breakthroughs occurring in this field, it may be a feasible alternative in the not too distant future.

7. FUNDING APPROXIMATIONS

Funding approximations for the various technical alternatives are chancy by nature. Systems component costs for high technology

equipment can at times vary from month to month depending on market forces, inventions, production breakthroughs, and applications. That is especially the case with rapidly developing systems such as satellites and satellite related equipment.

Other factors also make cost approximations dangerous. The passage of time can wreck havoc upon any calculations. Obviously, perhaps, the kind of system desired - i.e., the cadillac or pinto - has much to do with the ultimate cost.

Costs which cannot reasonably be anticipated - such as site purchase, road access, providing power, propagation studies, and so on - are not considered in this report because they would be meaningless. Equipment costs are based on average approximations for at least minimally reliable gear.

Special thanks is due Associate Professor Greg MacDonald of the University of Montana Radio and TV Department for his assistance in developing the figures that follow:

(1) TRANSMITTER[4]

a. 2 KW effective radiated power transmitter, antenna, connecting equipment.	$25,000 one-time
b. Microwave terminal equipment (modulator, demodulator, off-air receiver)	6,500 one-time
c. Power	500 year
d. Routine Maintenance (incl.tube,shared site)	1,000 year

e. Microwave transmission via MTN Mw System (Mt. Television Network has offered free use of its Mw system between Missoula, Butte, Great Falls, and Billings) — No charge

Initial Cost per Site	$33,000
Annual Cost per Site	$ 1,500

Should the MTN microwave system not be available, similar service from Mountain Bell would be about $60,000/year. Sites are assumed to be shared to avoid associated development costs.

(2) INCREASE NUMBER OF TRANSLATORS

a. Translators	$4,000/one-time
b. Routine Maintenance	500/year
c. Power	400/year

The number of translators required to cover the majority of Montana would depend on how many stations were used to provide the original signal. For example, if KUFM (Missoula) and KEMC (Billings) were the only two originating stations, the installation of a microwave fed transmitter in Great Falls ($25,000 assuming free use of Montana Television Network's microwave system and facilities, plus the cost of local insertion capabilities, if any) would permit good state coverage with the addition of translators. The number of translators would have to be determined by an engineering (propagation) study. If a Great Falls transmitter were put in place, and 40 translators were necessary, for example, the cost would be $25,000 + $160,000 = $165,000 for equipment only. Power, maintenance, site costs, and engineering work are not included.

(3) MICROWAVE/LOW POWER TRANSMITTER SYSTEM

a. Kw transmitter, antenna and connecting equipment, per site[5]	$25,000 one-time
b. Microwave terminal equipment, per site[6]	6,500 one-time
c. Routine Maintenance[7]	1,000 year
d. Power	500 year
e. Microwave service	See below
f. Site costs	See below

At each microwave repeater site, or nearby, it would be possible to install a transmitter. Extension of the signal would then be by use of translators. If the state owned its own microwave system, which it does not, microwave costs would probably be relatively inexpensive, or free. The Montana Television Network system, if its use were permitted for no charge, would of course cost nothing. Commercial microwave companies would have to charge a significant fee. Mountain Bell, for service between Billings, Great Falls, Helena, Bozeman, and Missoula would charge about $60,000/yr.

Site costs are unknown. Presumably, state or MTN sites would occur minimal costs. Commercial microwave carriers, of course, would charge for using their sites - if use of their sites were permitted at all.

(4) HARD WIRE TIES

a. $354/month per terminal (equipment)	$354 x No. terminals
b. $9.83/mile for "hard wire" connection	$9.83 x total miles
c. transmitter	$25,000 per site

Audio broadcast quality lines are not tariffed in Montana, and are therefore not presently available. Series 6000 Type 6153 lines are available, but are used for such service as Muzak subscriptions (music into offices). The usefulness of Type 6153 lines for broadcast quality signals is questionable, but could be determined by an experimental study.

The number of stations, either public or commercial, needed to construct a statewide network would have to be determined by an engineering (propagation) study.

(5) BICYCLING TAPES

a. Recorder (reel-to-reel), mikes, mixer	$ 3,500

Postage or other distribution fees are unpredictable and dependent on use of the programming.

Copyright restrictions apply to much material provided by programming services such as NPR. Montana originated programming put out by Montana public radio stations would not be restricted as to distribution for copyright reasons.

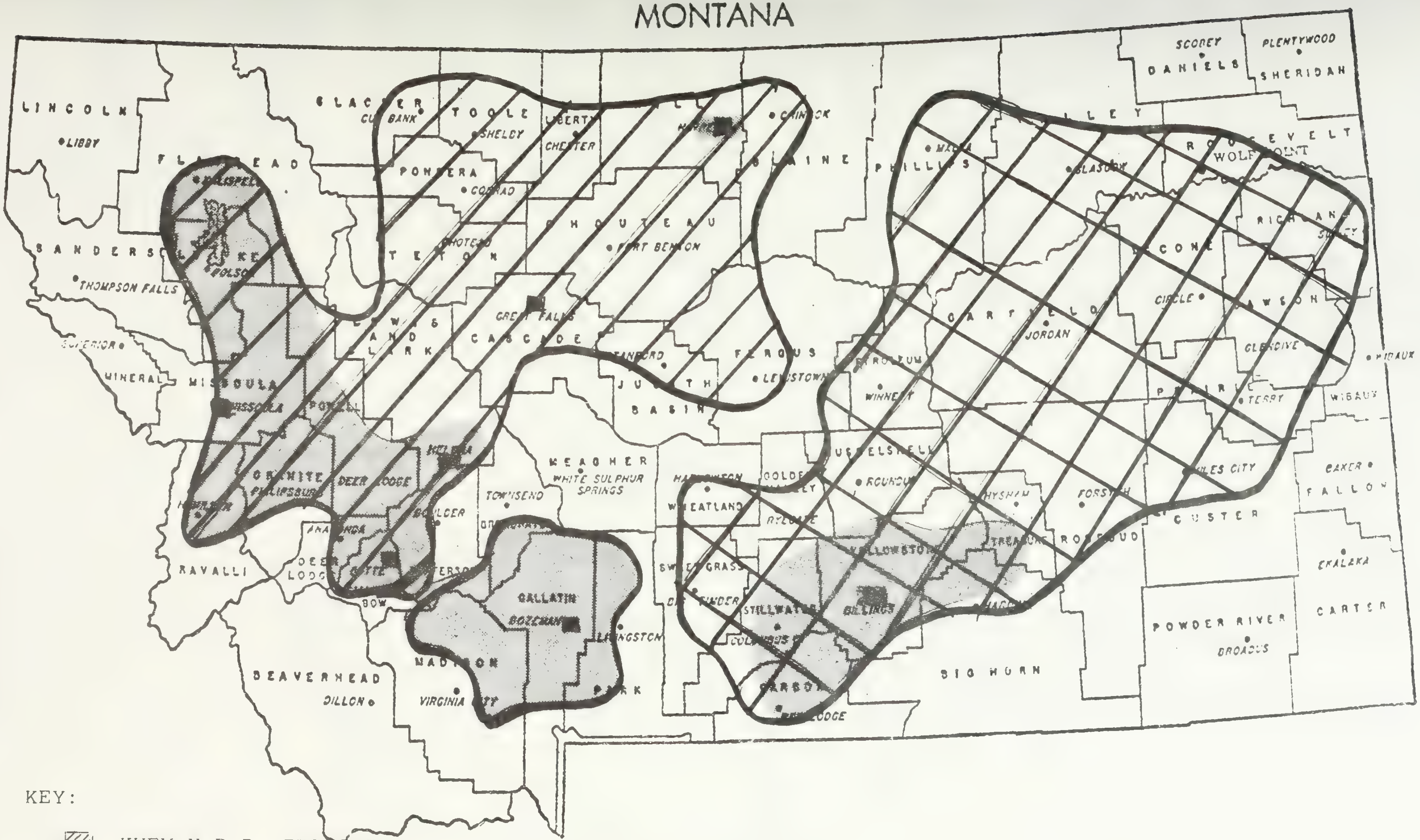
(6) SATELLITE[8]

a. Satellite 19dBW channel	$120,000/year
b. Downlink (incl. some site costs)	$ 10,000/one-time
c. Downlink low power transmitters	25,000/one-time
d. Uplink lease	36,000/year
-or-	
e. Uplink purchase	150,000/one-time

Satellite cost have been extremely volatile over the last several years. Costs of "c. uplink lease" and "d. uplink purchase" are mutually exclusive - the use of one precludes the need for the other. The cost of carrying a signal by microwave between the Seattle uplink and a Montana public radio studio is not included, but would be significant. In addition, the number of low power transmitters required would depend on which of the existing public radio stations made use of such a state provided satellite feed, the number of translators, and upon an engineering (propagation) study.

APPROXIMATELY 85% - 95% TOTAL POPULATION COVERED

MONTANA



KEY:

KUFM-N.P.R.-TRANSMITTER IN GREAT FALLS-7-8 TRANSLATORS

KEMC - 10-12 TRANSLATORS

PUBLIC RADIO STATIONS

CURRENT PUBLIC RADIO COVERAGE

MAXIMUM APPROXIMATE COST-$105,000

PUBLIC RADIO TASK FORCE

CHAIR: A. E. Clifford, Montana Telecommunications Project Administrator

NOTIFY: Includes all MTAC members on mailing list

Barnhart, Duane, Asst. News Dir.
KGLT-FM
1706 So. 19th, Apt. 6
Bozeman 59715
994-3001

Beatty, John
2200 Elm
Butte 59701
494-6100 (o.)
782-2408 (h.)

Bond, Jim, Information Officer
Dept. of Natural Resources
Helena
449-3647

Eckert, Mark, Manager
KGLT-FM
MSU
Bozeman 59717
994-3001

Flaningam, Dr. Rita
Dept. of Speech-Communications
MSU
Bozeman 59717
994-3815

Frasca, George
Drawer B
Seeley Lake 59868
677-2530

Hess, Philip J., Chairman
Radio-TV Department
U of M
Missoula 59812
125-4931

Hoene, Bob
Judge Advertising
213 5th Ave.
Helena 59601
442-3961

Jesselson, Dr. Robert
MSU
Bozeman 59717
994-3561

MacDonald, Greg
500 Daly
Missoula 59801
125-4931

Marble, Don
P.O. Box 649
Chester 59522
759-5104

Montagne, Joan
1105 So. Tracy
Bozeman 59715
587-2406

Morris, Dr. Nancy Tucker
1500 Parkview Place
Bozeman 59715
586-2415

Spitzale, David, Manager
KEMC
Eastern MT College
Billings 59101
657-2259

Tisdell, John
816½ Stoddard
Missoula 59801
243-4931

West, Bonnie
c/o The West Branch
P.O. Box 2802
Norris 59745

Widget, Dr. Lawrence A.
School of Education
University of Montana
Missoula 59812
125-2853

GLOSSARY

F.C.C. - Federal Communications Commission

N.P.R. - National Public Radio

C.P.B. - Corporation for Public Broadcasting

C.S.G. - Community Service Grants

FOOTNOTES

1. Greg MacDonald, Assoc. Prof., University of Montana, Radio & TV Dept.
2. Ibid
3. "
4. "
5. "
6. "
7. "
8. "
9. "
10. "

SECTION VII

GENERAL NEEDS ASSESSMENT
POTENTIAL TELECOMMUNICATIONS SOLUTIONS TO STATE PROBLEMS

Although the Project performed specific Needs Assessments pertinent to the various fields of telephony, data communications, land mobile systems, public television and public radio, and illustrated the results of those Needs Assessments in the preceding sections, the Project felt that a general state-wide Needs Assessment would also be pertinent to its efforts.

Unfortunately, the Project did not have the resources to accomplish such a task. However, it was able to discover that such research had been done elsewhere. This research was performed by the Cooperative Extension Service at Montana State University in Bozeman: The results were published in a report titled "Project 80".

Project '80, which was published in October of 1980, documented the identified problems existing in the State and listed recommendations as to the solution of those problems. The research performed in Project '80 was quite extensive, utilizing the input of over 3,000 community leaders. The report was divided into nine separate sections; eight of these were listings of district concerns (a district being several counties in size), while one section (the first), detailed the compiled and condensed findings of the entire State. The Project analyzed this section (included as Attachment One) in detail and determined that a substantial number (roughly 54%) of the problem-solving recommendations could be accomplished through telecommunications applications. These recommendations are identified by the black dots in Attachment One.

The format of Attachment One is such that the general topics of agriculture, natural resources, home economics, youth, and community development are followed. These were further broken down into sub-sets, as follows:

I. AGRICULTURE

1. Energy
2. Water
3. Inflation
4. Taxation
5. Family farm
6. Land use
7. Government
8. Pest control
9. Research, technology, education
10. Marketing
11. Public relations
12. Farm transportation
13. Conservation and range management
14. Labor

II. NATURAL RESOURCES

1. Land use
2. Water
3. Energy
4. Range
5. Soil
6. Mining and minerals
7. Forest management and timber
8. Air
9. Wildlife, recreation and wilderness
10. Waste disposal

III. HOME ECONOMICS

1. Family
2. Education
3. Energy
4. Economic management
5. Health
6. Nutrition
7. Community
8. Government

IV. YOUTH

1. Family
2. Communication
3. School system
4. Alcohol and drug abuse
5. Employment
6. Community involvement
7. Living skills
8. Recreation
9. Morality
10. Law enforcement
11. Social problems
12. The media
13. Health

V. COMMUNITY DEVELOPMENT

1. Energy
2. Transportation
3. Coping with growth
4. Government
5. Economy
6. Employment opportunities
7. Public involvement
8. Health care
9. Public services
10. Education
11. Water

The Project selected over two hundred recommendations wherein telecommunications could be utilized to assist in the completion of those recommendations. In this way, the Project hoped to illustrate the value of telecommunications as a problem solving tool; a pragmatic, functional methodology of satisfying the needs of the people of the State of Montana.

Upon further scrutiny of the recommendations of Project '80 that could utilize telecommunications to solve existing problems, the Project ascertained that these recommendations, in a telecommunications applications sense, could be categorized into five basic areas. These areas are local

education applications, educational system applications, applications requiring input from the public (although all applications require input from the public to some degree), state data-base applications, and miscellaneous.

These applications, with general telecommunications systems design concepts, are illustrated as Attachment 2-6, and serve as good introductory reading for Section VIII, where the Project has provided detailed technical systems design to apply these concepts of telecommunications use as a methodology to assist the people of the State.

GLOSSARY

CENTRAL PROCESSOR: A CENTRALIZED COMPUTER

C.I.O.: COMMUNITY INFORMATION OFFICE

C.P.U.: CENTRALIZED PROCESSING UNIT

CRT: CATHODE RAY TUBE: UTILIZED AS A TERMINAL GIVING VIEW CAPABILITIES WITHOUT HARD COPY

DATA BASE: A CENTRALIZED STORE OF INFORMATION PERTINENT TO A PARTICULAR SUBJECT

DEMAND: IN THE CONTEXT OF THIS SECTION, A REQUEST FOR INFORMATION FROM A HUMAN TO A SYSTEM

FAX: A FACSIMILIE DEVICE, TRANSMITTING HARD COPY INFORMATION OVER TELECOMMUNICATION SYSTEMS

INTERACTIVE: CAPABLE OF TWO-WAY COMMUNICATION, IN A RESPONSE SENSE

I/O: INPUT/OUTPUT

NODES: IN THE CONTEXT OF THIS SECTION, A LOCATION CONTAINING CENTRALIZED EQUIPMENT FOR COMMUNITY TELECOMMUNICATION USE

REAL-TIME: RELATING TO THE PASSAGE OF TIME AS IT ACTUALLY OCCURS, RATHER THAN A DELAYED-RESPONSE MODE.

TELECONFERENCING: GROUP COMMUNICATION UTILIZING TELECOMMUNICATION SYSTEMS IN LIEU OF TRAVEL

TELEMEDICINE: UTILIZING TELECOMMUNICATION SYSTEMS FOR THE PROCESS OF DIAGNOSIS AND INSTRUCTION OF MINOR MEDICAL PROCEDURES.

TELEMMETRY: UTILIZING TELECOMMUNICATION SYSTEMS TO MONITOR OR SURVEY A PARTICULAR SITUATION

TERMINALS: A DEVICE WHICH COMMUNICATES INFORMATION TO A COMPUTER PURSUANT TO HUMAN INSTRUCTION

USER: A PERSON UTILIZING A SYSTEM

FROM THE PAST—NOT THE ASHES, BUT THE FIRE

By
Carl J. Hoffman[1]

This publication documents the efforts and concerns of more than 3,000 ers in Montana who participated in a unique state-wide program called OJECT '80.

The broad objective of PROJECT '80 was to help Montana leaders:

1. assess significant changes that have taken place within the state in the last 25 years;
2. identify and prioritize major problems and potential opportunities that exist at the local, district and state levels in agriculture, natural resource development, youth development, family living, and community development; and
3. determine how individuals and groups might go about making their communities and state an even better place in which to live.

The participants, representing 55 Montana counties, took part in over 600 mmittee meetings at their own expense. It was at these meetings that the oblems, concerns and recommendations set forth in this report were identified, bated and prioritized.

An earnest effort has been made to reflect as accurately as possible the neral views of each committee. To enhance accuracy, the official delegates tending the state meeting received a copy of the report drafted for the specific mmittee on which they served. The delegates were asked to read the draft refully and to submit all suggested changes to the Cooperative Extension ervice Director's office. All suggested changes were, in turn, forwarded to the ppropriate committee for review by the chairman, vice chairman and recorder. hose suggestions judged as reflecting the general views of the various commit-es were incorporated in the final report.[2]

Thus it can be said that this report is an expression of how people in ontana at the grass roots level feel—their ideas, uncertainties, frustrations, nd their hope and optimism about the future.

The Cooperative Extension Service has already found the report to be a aluable aid in establishing program priorities. It is hoped other public agencies, rganizations, individuals and groups will find it equally useful.

REVIOUS CONFERENCES

The concept for this information-gathering quest, of course, has vital and portant historic precedents that date back more than 50 years.

gricultural Economic Conferences

It was in 1927, when one out of every three people in Montana lived on a rm, that the first set of conferences was held. At the time, there was great ncern about the vast amount of information being generated by the Experi-ent Station and Extension Service of Montana State University that was not eing used in planning the future course of agriculture in the state.

> "To determine how best to present this information and to make it available to the people of the state so that programs of agricultural development might be formed, a meeting of leading farmers, stockmen and representatives of business and industry of the state was called at

[1] Vice President for Extension & Continuing Education.
[2] The same procedure could not be employed in preparing the 40 district committee reports because of time constraints.

Bozeman, January 5, 1927. At this meeting it was decided to divide the state into six districts, to appoint representative men and women in each district to serve on commodity committees, and to hold agricultural economic conferences in each of these districts where committees might make their reports and adopt agricultural programs."[3]

Over 1200 people participated. The commodity committees established were Land Utilization, Forage & Grain, Livestock, Dairying, Poultry, and Horticulture. At some of the districts, other committees, such as Rural Family, were formed. A major concern of rural families in 1927 was the availability of fresh fruit and vegetables; another, women carrying water into the home; still another, stationary bathtubs, and wicks in lamps.

Rural Progress Conferences

In 1952, the Extension Service was asked to take the lead in another set of conferences. Instead of calling these agricultural economic conferences, they were titled "Montana Rural Progress Conferences."

Matters were more complex now. Since 1927 there'd been a depression, drought, unemployment, production surpluses, the development of federal farm programs, World War II, an ag boom, and the accelerated mechanization of farming. These and other forces gave birth to a whole series of problems addressed by the individuals who participated in the 1952 conferences. Organization of the effort agreed upon was a division of the state into seven districts.

"At a central point in each of these, it was agreed that the respective counties would come together for a district Rural Progress Conference in February. Community and county meetings were to precede the district meetings. In order to provide a general guide for proceeding, it was agreed that the effort in each county and in each of the seven districts would be carried out through the following committees: (1) Agricultural Resources, (2) Crops, (3) Livestock, (4) Irrigated Agriculture, (5) Rural Youth, and (6) Rural Family Living."[4]

The reports that came out of these meetings were then gathered and printed as a single publication. It was truly democracy in action.

PROJECT '80

Since 1952, new complexities have been added to the lives and occupations of Montanans.

The 1970's have been particularly unsettling. One farmer now feeds 60 people, and exports are essential to his well-being. Domestic diets, particularly those involving grains and meat, can have an immediate effect on Montana's largest agricultural commodities—wheat and cattle.

Today, conflicts abound with regard to water and land use development, the use of chemicals in agriculture and industry, the cost of energy, government regulations, and the changing role of women in today's society, to name just a few.

Because of these and numerous other developments in the last 25 years, the time was right for sponsoring a set of conferences similar to those conducted in 1927 and 1952. Thus, in 1979, plans were developed for PROJECT '80. Sponsoring the effort were Montana State University's Cooperative Extension Service, College of Agriculture, and Department of Home Economics, plus the County Commissioners of 55 Montana counties. Also providing support were farm

[3] *An Agricultural Program for Montana*, No. 84, Montana Extension Service in Agriculture and Home Economics, May 1927.

[4] *What the People Said at Montana Rural Progress Conferences, 1952*, Bulletin 274, Extension Service, Montana State College, June 1952.

organizations, commodity groups, homemakers, 4-H leaders, and numerous other gorups.

The chart on the next page indicates the kind of committee structure established at the county, district and state levels to achieve the objectives of the Project. The map following Page vi identifies the eight PROJECT '80 conference districts.

Organization and Content

In reviewing the publication, the reader will note that the state report summarizes the recommendations submitted by the committees participating in the state meeting. Presented in the district reports are the committee summaries of the eight district meetings. Those interested in a specific county summary should contact the Extension office of that county.

No attempt has been made in this publication to analyze or interpret the recommendations. This is left to the individuals, organizations and groups who are interested in or responsible for making Montana an even more desirable place in which to live.

What the publication does is permanently record the concerns, ideas and recommendations of grass roots people in Montana who participated in PROJECT '80.

Sometimes these contradict each other, but this is correct because it means there are conflicting points of view as is the truth about most positions in our society. And as these contradictions are identified, there may be opportunities for conciliation and harmony.

In terms of democracy, the PROJECT '80 process proved effective. The participation was awesome. The press coverage invaluable. People can and do speak; and Montana State University can and does listen as evidenced in the steps it has already taken to redirect its Extension and Research programming efforts. We urge other individuals, organizations, agencies and groups to join us in this venture.

COMMITTEES				
Youth	Home Economics	Community Development	Agriculture	Natural Resources

COUNTY

In most cases, two meetings were required to accomplish the overall objective of PROJECT '80 at the county level:

1st Meeting
- Purpose of Project explained to entire group (20-minute slide/tape presentation).
- Group broken into committees. Each committee identified problems and opportunities in its assigned area.
- Contributions of Committees summarzied and mailed to participants who were instructed to come to second meeting prepared to make recommendations.

2nd Meeting
- Committees met to develop recommendations.
- Committees reported back to entire group.
- Each committee elected a representative to attend district conference. Other members could also attend if they wished.

DISTRICT

A two-day conference was held in each of the eight districts established for PROJECT '80. Purpose of the conferences was to:
- Identify problems and opportunities existing in each district.
- Assist in establishing major programming thrusts.
- Anticipate future changes and recommend adjustments that would need to be made to deal effectively with the changes.

STATE

The culmination of PROJECT '80 was a two-day state conference. Participants included official delegates elected at each of the district conferences, plus all interested individuals who took part in the county or district PROJECT '80 meetings. In addition, the leadership of relevant state organizations were invited to participate. Purpose of the conference was to:
- Review problems and opportunities identified at county and district conferences.
- Establish state priorities based on needs as identified at county and district conferences.
- Explore strategies for implementing program priorities.

Organizational Structure Established to Achieve Objectives of PROJECT '80.

State

AGRICULTUR
NATURAL RESOURCES
HOME ECONOMICS
YOUTH
COMMUNITY DEVELOPMEN

AGRICULTURE

CHAIRMAN
...Jorgenson, Roundup

...E-CHAIRMAN
...Hodgekiss, Choteau

This report includes problems and concerns discussed at counties and districts, and then combined in order of priority, at the state meeting.

PROBLEM NO. 1 — ENERGY

Energy is vital to the economy and well-being of agriculture and the nation. Unfortunately, our state and federal governments lack long-range energy policies. One result of this lack is that agriculture has no priority in an overall energy plan. The U.S. is also too dependent upon only a few energy sources. Foreign oil prices are therefore too high and ruining our international balance of payments. High prices for energy are the main causes of our continuously increasing inflationary spiral. Agricultural producers, with their high dependency on power-driven equipment, are therefore suffering from continued high costs of the energy they need.

Other observations regarding the problem of energy are:

There's a lot of information available about energy, but most agricultural producers aren't making effective use of it.

We aren't energy conscious enough and therefore technology about alternative energy sources is insufficient.

Distribution of energy supplies continues to be a problem, with difficulties also due to government red tape. More production of energy is also hindered by the red tape.

Environmental interests need to be balanced with the demands for more energy production. This has not been accomplished.

High cost energy is and will continue to be one of the major problems facing agriculture. Therefore, recommendations to help solve the energy problem should be considered in three phases: those actions that need to be taken immediately; those things that also need to be accomplished to insure an economical energy supply for the next decade; those programs that will enable this country to become energy self-sufficient for future generations.

Recommendations — Overall

1. Ag producers must learn to conserve energy through better farming practices by using such methods as chemical fallow, minimum tillage, multiple hook-ups and more efficient use of equipment.
2. Industry must be encouraged to become more energy-efficient by using, where feasible, alternative sources of energy.
3. Industry could and should start producing more fuel efficient equipment.
4. Suppliers and producers of energy need to inform those in agriculture, in a more timely way, about the true availability of fuel supplies.

Research and Education

1. Funding should be made available for exploring and exploiting alternative energy sources, and then developing information relative to their practical adoption in Montana.
2. Research should be conducted to determine practical ways of conserving energy in agricultural production.
3. The Extension Service should develop educational programs for dispensing ag research station findings and for encouraging conservation by the general public.

Government

State

1. If a state allocation system for fuel should become necessary, the agricultural sector, as a supplier of food products, would have to receive a high pri-

ority, to be assured of a stable, adequate supply of fuel and other energy needs. This allocation and information concerning it should be known by farmers well in advance of production schedules.

2. We should reduce the regulations imposed on the development of alternate energy sources and all environmental restrictions should be reviewed and possibly rewritten with more flexibility.

3. We should provide adequate funding for Montana Experiment Stations for research to develop new energy, and possibly for incorporating an energy extension service into the present system.

4. We should use revenues from taxes on organic fuel extraction to fund research for new energy development.

5. Tax incentives should be used to encourage more efficient use of present energy sources and to develop alternative energy sources.

Montana's Congressional delegation and representatives of the state legislature should meet together to act on energy policies for the state.

Government

Federal

1. The Northern Tier Pipeline must be constructed. Montana has more to gain by its completion than any other state.

2. If a national allocation, or a rationing, of fuel would be necessary, the energy needs of agriculture and allied industries should be given high priority.

3. Domestic oil developers should be encouraged to increase drilling and production of crude oil and natural gas with the incentive of a fair price.

4. The Federal Government should expedite programs that will encourage the development of alternate sources of fuel. The building of alcohol plants, both large and small must be encouraged. The use of wind energy, solar energy, and combustible by-products merits development programs of considerable size.

5. The Federal Government should develop a long-range National Energy Program that will have as its goal making the United States self-sufficient in the production and distribution of its total energy needs. This program must give a higher priority to meeting the needs of agriculture and associated industries than to maximizing profits of non-agricultural related. This program should also result in a workable mass transit system, emphasizing the use of rail transportaion. Also, industry should be required to use coal as a fuel source, where practicable, and not compete for energy supplies that are required for mobile use.

6. The United States Department of Energy must be monitored closely by Congress and others so that the best interests of industries like agriculture which produce, process and market our renewable resources are adequately protected from arbitrary administrative actions.

PROBLEM NO. 2 — WATER

Food and water are the most essential needs of humankind. Montana's number one industry — agriculture, which supplies food, depends heavily upon proper management of its water supply.

The complexity of federal and state water rights, claim filing requirements, conservation, lack of development of existing and additional water supplies, are all priority problems facing Montana's water users. Producers are also concerned about maintaining the quantity and quality of water for agricultural use throughout the state.

Recommendations

Water rights and adjudication should be maintained by the state judicial system.

2. Off-stream storage for flood control and irrigation should be expanded. Recreational use would be a spin-off.

3. A water development and conservation education program should be provided by the Montana State University Extension Service and Soil Conservation Service of the USDA to include the following: best practices regarding irrigation management; low energy irrigation systems; ditch consolidation where feasible; water re-use systems; encouragement of 90 percent ACP cost-sharing irrigation conservation practices; updates of current applicable water laws, and atmospheric water research.

PROBLEM NO. 3 — INFLATION

The capital needs of agriculture are great compared to most other business and will continue to increase in the future. The low rate of return on a high investment, coupled with a high degree of risk, creates a serious financial problem for agriculture in the best of times. The effect of uncontrolled inflation compounds this problem. The lack of self-discipline by government, labor, business, and individuals is a contributing factor to inflation.

Recommendations

1. All government levels must balance their budgets and use self-control in spending.
2. Financial management and money matters should be taught more extensively in our schools.
3. Montana State University agricultural students should have a mandatory financial management course in their curriculum before graduation.
4. The state legislature must enforce the provisions of the Sunset Law more diligently.

PROBLEM NO. 4 — TAXATION

Two major concerns are inheritance and property taxes.

The inheritance tax law and regulations are not well understood by many people. Many farmers have not been able to transfer ownership of their property to other family members because of excessive federal and state inheritance taxes.

The use of property taxes to finance education is causing an unfair burden on the land owners.

There appears to be excessive amounts of money spent for tax administration and on the apparent lack of management. Also, the administration and control of taxes is too far removed from the local areas.

Recommendations

1. The state legislature and Congress raise the limit of a non-taxable inheritance to $2.5 million on family farms with an escalation clause to match prices.
2. A sharp reduction in property tax should be made and a greater dependency be made on the mineral severance tax and the income tax.
3. Sunset laws should be enforced to insure that program efficiency is monitored and to eliminate duplication between agencies.
4. Courses should be continued that are similar to the estate planning correspondence course of the Extension Service.

PROBLEM NO. 5 — FAMILY FARM

Non-farm corporate and foreign ownership in agriculture have been increas-

ing. If this trend continues, agriculture will eventually become controlled by a few corporations which will lead to the elimination of the traditional family farm. Land prices will rise and the young person interested in farming will be unable to enter or compete in agriculture. Big corporation agriculture may then control production and marketing, may create food shortages, and in the long term lower production efficiency. All these will contribute to greatly increased food prices to the consumer.

Unrealistic land values, inheritance and estate taxes make it very difficult to pass on a farm from one generation to the next. High interest and capital investment deter young people from returning to the farm to replace farmers of retirement age.

Recommendations

Closely monitor foreign ownership of agricultural land and the effect on the traditional family farm. (ESCS)

2. The legislature should eliminate the present tax advantages that are received by foreign ownership.

3. All land and products should be taxed equally, including that owned by non-profit organizations and by foreigners.

4. New revolving loan pools, similar to programs in effect in Minnesota and North Dakota, should be developed by the legislature using coal severance tax funds to provide low interest loans to young farmers for land purchases.

5. All federal and state inheritance taxes should be eliminated and gift taxes lowered to enable a farmer or rancher to give land to another producer.

6. Develop tax incentives at the state and federal level to encourage older farmers and ranchers to sell their land to beginning farmers and ranchers who have a low equity in their property.

People should become aware of the need for education in estate planning as provided by the Extension Service.

8. FHA farm loan policies should be amended by Congress to speed up processing time and to make it possible to buy an economic unit.

PROBLEM NO. 6 — LAND USE

Approximately 310,000 acres goes out of agricultural production in Montana each year. Rural subdivisions tend to make problems with water supply, sewage disposal, road maintenance, and to increase the amount of fuel used in commuting. Changes in land status reduce energy efficiency, lower productivity, create erosion and the working of sub-marginal lands. Lack of awareness and education seems to lead to only a limited participation by the people in land use planning on both local and state levels. Saline seep is another fast growing problem.

Recommendations

Greater participation in local planning functions should be encouraged; and an increased awareness on the part of the landowner as to existing land use problems should be developed.

2. The legislature should review and revise the Greenbelt Law for the purpose of making it more definitive and more easily understood. A suggested change is to have it that a tract of land must produce at least $2,500 per year to qualify for agricultural status designation, or that the tract grow agricultural produce for sale or home consumption the equivalent of 25 percent or more of the owner's total annual earnings.

The Extension Service should expand its involvement with problems affiliated with small tracts of land intended by the owner for agricultural use.

4. Appropriate agencies should provide education encouraging land-

owners to utilize land in accordance with its capabilities.

5. ASCS and SCS should redirect and coordinate their own programs to promote the use of land according to its capabilities.

6. Federal conservation programs (ASCS and SCS) should include education for farm operators, or other landowners, who are adjacent and contributing to saline seep problems of other lands but who are not affected in their own land.

PROBLEM NO. 7 — GOVERNMENT

Agriculture for many years has been used as a political tool by the State Department for foreign policy actions without adequate compensation to agricultural producers.

There are many appointed governmental agencies involved in agricultural policy making. Most of these agencies are not agriculturally orientated or supportive. Their actions are many times based on emotions and on the influences of non-agricultural interests. These agencies are typically top heavy with administration and understaffed in local areas. They lack coordination between themselves and many times duplicate their effort. There is a lack of agricultural involvement in government programs, in policy determination, and in the formulation of realistic regulations. The programs that are set up and adopted are not flexible enough to be adapted to local situations. In some cases, they are completely unnecessary.

The government encourages and the American people expect a cheap food policy.

Recommendations

1. Every effort should be made to get the federal and state government to include farm families in the regulatory and program development process.

2. There is a need to eliminate duplication and overlap in different agencies.

3. The federal government should confine its policies to dietary information and not to recommendations as to the type of diet to follow.

PROBLEM NO. 8 — PEST CONTROL

The increased numbers of agricultural pests including rodents, predators, and infestations of noxious weeds are affecting thousands of acres of range and cropland and jeopardizing livestock production. The losses from these pests will continue to increase unless economical, effective methods of control can be developed.

The control procedures that are used are limited by a lack of knowledge, funding, access to land, and regulations regarding chemical application. There is a lack of cooperation between private, county, state and federal interests.

Also, environmental pressure groups do not understand the producer's problems and the economic troubles that may develop further with increased pest damage.

Recommendations

1. Predator and rodent control should be administered at the state and local level by the Montana Department of Agriculture.

2. Research and control of agricultural pests should pursue an integrated approach using chemical and biological means through the Agricultural Experiment Stations and Weed Districts.

3. The federal government should participate in noxious weed control through ACP Programs and the following agencies: local ASCS committees, Forest Service, BLM, and the Park Service.

PROBLEM NO. 9 — RESEARCH, TECHNOLOGY, EDUCATION

The Agricultural Experiment Stations and the Cooperative Extension Service have produced and disseminated a great deal of useful agricultural technology. The public and the legislature has not recognized the importance of this research and education and its impact on this state's economy.

The lack of adequate funding has made it impossible to get some recent available technology out to the people, and much of what is available is not being utilized, therefore, by some of the agricultural producers.

There is an unsatisfied need for additional research, funding in animal science, crop science, equipment, marketing, and energy areas that will allow the producer to become more efficient.

The Diagnostic Lab in Montana is not responsive to the producer's needs.

The Federal Government has decreased its emphasis in plant and animal research.

The USDA has shifted emphasis from agriculture to environmental and consumer concerns, to the detriment of agriculture.

Recommendations

1. Expansion of needed research in any of the problem areas, or expansion of educational efforts cannot occur without increasing the funding essential to meet these needs.
2. We recommend that the state legislature increase the appropriations for agricultural needs, in particular for agricultural extension and research. They should be funded at a level proportionate to agriculture's contribution to the state's general fund. At present, agriculture contributes approximately 37 percent of the state's general fund, but only four percent of the general fund is used for support of contributing programs.
3. We recommend the efforts to improve the cooperation and thereby the effectiveness of the Diagnostic Lab at Montana State University, the state veterinarian, and Livestock Board. We recommend that these efforts continue and that the animal health and diagnostic service work remain at Montana State University. We recommend that no related research projects be directed to other entities.
4. We recommend that the emphasis now placed on consumer concerns be returned to agriculture in order that research, education, and technical assistance be funded at an effective level.
5. We recommend that SCS personnel be allowed to move up on a pay scale for two-five years without having to make a move up to a new locale.

PROBLEM NO. 10 — MARKETING

In some cases agricultural producers have limited access to marketing information or fail to utilize what is available. Present-day agriculture demands that producers be aware of world-wide market information and prices.

Areas of major concern are that additional markets need to be developed, supply fluctuations are out of pace with demand, government intervention in the market is too frequent, and the extent to which large corporations control vertical integration is a problem.

Recommendations

1. Market research by the Extension Service for alternate crops should be developed and the Wheat Research and Marketing Committee should work to expand foreign markets and develop Montana's participation in these markets.
2. The federal government must enforce equal standards for imported meat products and for those produced domestically.

3. Agriculture should not be used by the state department as the sole tool in international negotiations.

4. Agricultural groups and local development corporations should develop in-state processing plants for our local products.

PROBLEM NO. 11 — PUBLIC RELATIONS

The true worth and the wholesomeness of the food produced by Montana farmers and ranchers are poorly understood by the general population of this country.

The political actions of government that continue to advocate a "cheap food" policy are not in the best long range interest of the consumers of the United States. It doesn't promote a policy that will be in the nation's best interest in foreign trade. The productiveness and efficiency of United States agriculture as compared to other countries is not fully appreciated in this country.

Agriculture's image has suffered, in the past, from the multitude of voices that have purported to speak for it. Since agriculture represents less than four percent of the total population, it is very difficult for it to be effectively heard and understood unless farm organizations work in a cooperative way.

Recommendations

1. Local land owners and the Fish and Game Commission should work together to establish workable game policies for each area.

2. Stronger trespass laws should be developed against motorized vehicles.

3. More federal land should be managed under the multiple use concept and less land should be given wilderness status. The public should be made aware of the compatibility of agriculture with the public land use. An example is the livestock grazing system on Forest Service land that allows both the management of game and of the range for cattle and sheep.

4. A cooperative effort by the various farm organizations in support of a unified effort to tell agriculture's story should be organized.

PROBLEM NO. 12 — FARM TRANSPORTATION

Many areas, particularly eastern Montana, are situated long distances from consumer centers. There is discrimination in freight rates in this area of the state in terms of cost per ton mile. There is also a lack of rail competition due to the loss of the Milwaukee Railroad. Truck transportation cost is particularly high because of regulations set by the ICC and MRC regarding backhauls both intra- and inter-state, permits, licenses, insurance and gross vehicle weights.

The regulations set by the ICC are not uniform throughout the continental United States due to an appointed government agency that has no regard for individuals and free enterprise. The monopolization of transportation in Montana, particularly by rail is a problem for shippers.

Recommendations

1. Uniform regulations from state to state on federal highways must be established.

2. Agricultural producers oppose the deregulation of railroads due to lack of competitive rail service.

3. The ICC should be reorganized to make it more responsive to the public with emphasis on freight rate structures that allow for uniform ton-mile rates nationwide.

4. Emphasis must be placed with the State Highway Department for the up-keep and improvement of rural farm to market roads, such as Highway 200

from Great Falls, Montana to the Snake and Columbia River in Idaho and Washington.

PROBLEM NO. 13 — CONSERVATION AND RANGE MANAGEMENT

The most valuable assets to Montana's economy, her land, water and natural resources, are not being given the attention that it will take to preserve productivity. State and government agencies charged with the responsibility of assisting in these areas are finding it necessary to cut back on services. Decisions involving intensive agricultural practices, natural resource development, and industrial land utilization are often made with little or no concern for conservation.

Recommendations

- All agencies need to continue their outreach functions to producers to correlate conservation practices and economic returns.
- Emphasis should continue to be placed on the education of our youth in conservation practices.

PROBLEM NO. 14 — LABOR

There is a clearly defined shortage of well-trained reliable agricultural workers.

Recommendations

1. The Montana Extension Service should analyse the alternatives and provide information to agricultural producers on the following: examples of on-farm incentives to encourage long term employment, such as with crop, livestock or land percentages; incentives to farmers and ranchers who are willing to provide on-farm training of employees to be subsidized by the Job Service or a similar agency.

ATURAL
SOURCES

HAIRMAN
Feeding, Jordan

This report includes problems and concerns discussed at county, district and combined at the state meeting.

A number of concerns were identified which apply equally well to all of the natural resource areas discussed. These concerns about government regulation, communication, and education, were consolidated and used as the introduction to the report.

Government controls over minerals, wildlife, water, timber, land and energy are a result of laws passed by legislative bodies. Many of the rules and regulations derived from interpretation of these laws are confusing and in conflict with one another, especially when applied at the local level. The average person must comply with a maze of regulations from a variety of agencies in order to develop irrigation water, work a mining claim, use federal grazing land, or log private or forest land. The regulations are not coordinated or standardized. They vary from agency to agency. Few people know what steps are needed before attempting a regulated activity. A source of such information is badly needed.

Public agencies, though they have procedures for involving the public, too often are perceived as unapproachable or "just going through the motions." Notification procedures about hearings and their timing do not often alert affected parties to make considered responses. Advisory boards may be restricted too much to provide meaningful local input.

Although there is communication between agencies, activities on adjacent lands administered by different agencies indicate coordination and cooperation are minimal. Communication between interest groups is also minimal. All groups, especially those with opposing interests, need to share their ideas to solve natural resource conflicts affecting their mutual interests.

The level of technical information available on many natural resource topics exceeds what is being applied on the ground and there is a need for implementation. But little technical data is available, or is not well publicized, in other areas such as development of alternative energy sources; small scale farming practices and machinery, and specialty products adapted to small farms.

Though environmental education is required in public schools in Montana, implementation is difficult. Environmental education is viewed by some as brainwashing children against their parents means of livelihood; by others, training in natural resource management practices encourages the "rape" of the land. What one agency considers a conservation policy another may consider environmentally harmful. Environmental literature available to teachers reflects these conflicts of viewpoint and often causes confusion. The limitations are also evident by the lack of lesson plans to explore the value of farm lands as natural resources, and the role it has for farm community children, Indians and migrant workers. Environmental Education must also include a background in Economics, the underlying determinant of development.

PROBLEM NO. 1 — LAND USE

Land use planning has been inadequate and developed without extensive knowledge of soils, basic environmental information, and practical knowledge. Consequently our land has not always been developed or protected for its highest and best use. The traditional agricultural use of land has been challenged by recreation, urban sprawl and unreclaimed mineral development. Increased emphasis on preservation of historical sites and artifacts, wildlife habitats and wilderness also puts pressure on public and private land use. Ways to gain access across public lands as well as the "strategic" use of eminent domain to gain access across private land have not been adequately evaluted. Finally, restrictions on recreational activities and the lack of adequate natural resource management within Indian reservations should be examined closely.

Recommendations

1. County or District land use plans should be developed through community action group techniques.
2. The Extension Service and Soil Conservation Districts should consolidate natural resource data for use in development of land use educational programs.
3. Methods should be developed through legislative enactment to either consolidate subsurface rights with surface rights or to force those with subsurface rights to share in tax liability.
4. We should develop better accountability of easements and covenants (i.e. road, corridors, etc.) that affect surface rights-in-title.
5. We should consolidate and eliminate small or unnecessary tracts of public land, and excessive wilderness and primitive areas.
6. A better balance should be obtained between 'highest and best use concept' and such things as the aesthetic, wildlife, the historic and archeology.
7. The laws and administration of trespass and eminent domain should be revised to add importance to landowner considerations.
8. State lands and their enforcement should apply equally on all lands within the state, particularly on Indian reservations and other federal lands.

PROBLEM NO. 2 — WATER

There are many parts to the large problem of water, its use and control. The major concerns are: the questionable future availability and quality of both surface and underground water; the contamination and depletion of ground water; the current system of assigning priorities of water rights; the planning of adequate flood protection; the ignoring of water quality laws; out-of-state preemption, contamination by municipalities, and by industrial and agricultural users.

The 208 Clean Water Act and other water quality control enactments are not well understood nor are the regulatory actions of local, state and federal agencies always conducive to good water use. There is confusion over Indian water rights, making water claims and about all types of water right filings.

Interest in the preservation of water is very slow in developing. Opportunities for additional storage behind dams and the adoption of proper water conservation practices to increase water supply (storage in soil and groundwater) need to be pursued. The necessity of having minimum flows for municipalities, wildlife, recreation, water quality, and energy is making increased demands for larger water supplies. Water development is hampered by the lack of an inventory of the total water supply, by the lack of sites specified for development, and by the lack of citizen interest about water planning and development.

Many citizens do not recognize the need to invest in water development and improvement in order to keep up with the increasing value of land and water.

Recommendations

1. Agricultural users should upgrade their current irrigation facilities and establish new ones to include better dikes, off-stream and high-lake storage. Ditches and canals should be considered and conservation practices should be applied which store water in soils and in subsurface areas.
2. A water improvement and development program for Montanans should be written by the effort of people at the grass roots in cooperation with state and federal agencies.
3. Measures should be taken to reduce the pollution of surface and underground water, and to maintain and improve the water quality.
4. Owners of water rights should be urged to register them.

5. Water use laws should be a means for better utilization of our water when problems arise.

6. Research should be conducted to determine the possibility of use of small water power plants whenever feasible.

7. Incentive programs for efficient use of water, such as in offering low interest loans or tax breaks, should be developed to help implement conservation measures.

8. We must develop and employ better irrigation techniques by sprinkler and other types of systems.

9. Weather modification research should be continued.

PROBLEM NO. 3 — ENERGY

There is a shortage of developed energy supplies. We lack technical information on energy resources. There is a conflict between the demand for energy and the constraints of environmental protection. One result is the great length of time it now takes to try and develop energy facilities. The increasing cost of energy is also placing an added burden on the agriculture industry. More efficient and less expensive means must be found for generating electricity. More education is needed on energy conservation. Additionally there are extreme problems with facilitating the development of rights-of-way for powerline and pipeline corridors.

Recommendations

1. Uses of agricultural crops, wood wastes and municipal waste should be developed for energy production.

2. We should develop a coordinated system to provide reliable technical information on alternative energy sources such as solar, thermal wind, MHD, low head hydro-power, etc.

3. An index of all local, state, and federal regulations that apply to the use and development of energy should be prepared for people who plan to develop some kind of energy source.

4. Agencies should work for coordination among themselves to standardize and simplify the regulations, and to encourage compliance without adding excessive delays and cost.

5. More energy efficient means of generating electricity must be developed.

6. Local energy sources should be developed first in order to cut down on the need to transport energy from other places because it takes additional energy to transport energy.

7. We should encourage far-sighted planning to gain rights-of-way that can serve both pipeline and power line needs.

PROBLEM NO. 4 — RANGE

Rangeland, both public and private, is subject to economic and environmental pressures. These pressures result in overgrazing, noxious weed infestations, erosion, watershed degradation, damage to riparian areas and wildlife habitat. Conversion of rangelands to sites for other uses is also a problem.

Recommendations

1. Extension Service and Soil Conservation Districts should work toward the accelerated implementation of Montana Rangeland Resources Program at state and local level. Research and management techniques, and the personnel of the Extension Service should be dramatically expanded.

2. The Rangeland Loan Program should be expanded and broadened.

PROBLEM NO. 5 — SOIL

Because poor land management practices are resulting in inappropriate use of soil and are contributing to land degradation, they are a concern. Examples of this degradation are: erosion caused by improper tillage and cropping methods, cultivation of marginal land, saline seep, noxious weed infestations and chemical contamination.

Recommendations

Extension Service should join in the leadership to accelerate the completion of statewide soil survey.

A joint Soil Conservation Service, Extension Service, Bureau of Land Management, and Forest Service statewide program to educate land users on use of state soil survey data should be organized.

3. Incentives such as tax breaks, low interest loans and price supports should be employed to implement and continue good soil conserving practices.

4. All state and federal research programs pertaining to soils and soil conservation should be consolidated, with the responsibility and funding placed with the University system.

5. We should strengthen the role of local authority (planning boards, Soil Conservation District, County ASCS Committees) to implementing conservation measures as opposed to simply identifying and recommending solutions to such problems as: saline seep, cropping practices, wind and water erosion, weed infestation, chemical contamination of soil resources.

PROBLEM NO. 6 — MINING AND MINERALS

The development of Montana's vast mineral reserves, both strippable and deep minerable may be greatly accelerated. Problems now inhibiting this development include: cumbersome, inflexible and unreasonable exploration and mine permitting procedures; arbitrary taxation that is not tied directly to resource development impact costs; inaccountability of special interest groups and of regulatory agencies for their actions; and reclamation requirements that do not always consider the desires of the landowner or of improved surface utility. There are minimal rail facilities for transporting coal and other mineral materials. Local ordinances also threaten to hinder transportation of some materials.

There is insufficient research in the area of mine waste disposal, particularly of hazardous wastes. People in the industry are not well informed about their responsibility, nor is the public aware of the activities of industry. Safety regulations are too stringent for small operators as for example, those with fewer than three employees.

Much of the mineral resource on public land is not available for development as a result of wilderness classification, roadless areas, and other restrictive designations. This is viewed as a failure to continue the multiple use concept of public land. Failure to control imports is also hurting our mining industry. Government regulations interfere with the economic competitiveness of the Montana mining industry as against imported minerals.

Recommendations

1. The state should streamline laws pertaining to mining, exploration and reclamation; coordinate and consolidate agency responsibilities to provide equitable enforcement of laws, regulations and taxes.

2. Shippers should help encourage adequate rail transportation.

Research and education are needed for the effective disposal of hazardous wastes and the efficient use of mine waste materials. There must be better communication between industry and the public to promote more understanding

of goals and the needs of the industry.

4. Safety regulations for small operators should be streamlined to help diminish the burden of current economic pressures.

5. We should encourage the multiple use of public lands so that mineral exploration and development can co-exist with agricultural, recreational and other uses.

6. We should restrict the imports of minerals unless domestic production fell short, and we would need imports in order to meet domestic needs.

7. Encourage easier supplies of funds to help control potential or probable community impacts that would occur as a result of mineral resource development.

PROBLEM NO. 7 — FOREST MANAGEMENT AND TIMBER

The forest resources of Montana have many conflicting uses and groups contending for special considerations. There is also a lack of proper forest management. This lack results in high grading, which may be termed exploration versus forest management. We often take the best timber, leaving the worst with no provision for regeneration. Other forest management problems include: insufficient reforestation and thinning; insect and disease management and control; weed, watershed and soil problems, harvest of firewood, and conflicts between the demands of forestry and of range managements. There is also a lack of understanding of forest management practices by the general public.

A lack of proper management of privately owned timber lands is also a considerable problem. This is often due to private owners not having large enough holdings to make an economic unit. For example they may have only one harvest in a lifetime, which then leads to a de-emphasis of continuous proper management. A part of the problem may be lack of coordination between private, state and federal land owners. Included in problems with private timber management is the need for more shelterbelts and rejuvenation of old ones.

We have problems with the forest product economic system. These problems include transportation, distance from consumer markets and the sharp fluctuations, up and down, of the forest products market.

There are several other issues, related to fire control, which are not adequately addressed. These include protection of areas outside of national forest boundaries; wilderness area fires and fire dangers related to real estate developments of forested areas.

Recommendations

In general, forest managers on private lands have few incentives and they receive little information. An adequate amount of assistance is already available to private landowners but because of economics and apathy, they often do not practice good forest management. Reforestation and thinning is hardly practiced with the result that there is less produced than can be.

It is felt the Extension Service could help by hiring an extension forester to gather and disseminate useful forestry information and research, as well as making the forestry issues known to the general public.

2. The Montana Forest Practices Act should be promoted.
3. There should be a depletion tax on timber.
4. Railroad transportation should be encouraged.
5. Rural fire protection must be improved.
6. We should increase the incentives to encourage good forestry practices on private land.
7. We should continue to carefully examine resource availabilities in proposed wilderness areas.

8. Better utilization of timber should be accomplished.

Information on cottonwood forestry should be developed and disseminated.

Information on wood energy alternatives and technology should be provided.

PROBLEM NO. 8 — AIR

Air quality standards are determined by the agencies charged with responsibility for them. These standards are not always adequate, enforceable or acceptable. The main areas of concern are in: agriculture, industry, municipal services and public lands management.

Agriculture air pollution involves dust from plowed open fields, from excessive grazing, feedlot operations and wind erosion. Industrial air pollution may come from construction and operation of industrial plants. Municipal pollution comes from road and street construction and management. Other municipal air pollution results from operation of the sewage and waste treatment plants. Residential pollution comes from the combustion of fuels. Public land management such as wildfire non-control and excess grazing by wildlife can also cause air pollution.

Recommendations

Clean air standards should be enforced, with conflicts resolved. Independent non-partisan monitoring should be attached to all major plants.

2. Industries should be promoted that can produce products without polluting the air.

The public should be provided with more information on the use of wood stoves, resulting in a minimum of pollution.

4. We should pay incentives for reducing air pollution and for implementation of best management practices which control air pollution.

5. Air quality standards should be developed which are adequate for control, enforceable, acceptable, but not excessive.

6. Industries with potential for air pollution should be located where they will least likely injure population and prime agriculture and timber resources. Favorable consideration should be given to industry that may do some damage to the air that is not totally destructive, and which can be accommodated.

PROBLEM NO. 9 — WILDLIFE, RECREATION, AND WILDERNESS

Man's activities and Nature's are coming into increased conflict. Human usage and access to natural resources for recreation, agriculture, and industry is bringing much pressure on resources and will affect everyone.

Agriculture is plagued with problems of inadequate predator control, threatened water supplies, increased governmental land restrictions, and the public's abuse of private land.

More property located recreation facilities are needed to meet the demand of population centers. To meet this increased demand governmental agencies have designated large tracts of land to be used for specific activity. In addition private game farms have added problems by contaminating and dislocating native species.

Better coordination is needed between all governmental agencies involved in the enforcement of wildlife and recreation laws. Because Montana has many different jurisdictions operating, conflicts occur. Hunting and fishing jurisdictional inconsistencies and disputes between the state and Indian Reservations is one prime example.

The Fish and Wildlife Service has increased pressure for preservation of all

wetlands in areas where some of these may be contributing to the development of saline areas, which are environmental pollution hazards to the surrounding land and water.

By turning vast acreages into wilderness with a limited use, we are contributing to poor relations between motorless recreationists and the motoring users. There is strong opinion that increasing wilderness designation is seriously hampering agricultural and industrial productivity.

The local tax base is being eroded by private land being transferred to public ownership. In lieu payments do not always match loss of local taxes. Loss of wildlife habitat is a major problem in maintaining future wildlife populations. There are few incentives for the private landowner to maintain quality wildlife habitat.

Recommendations

A complete inventory of water resources should be undertaken. Wasteful water practices must be eliminated. Off-stream storage reservoirs to maintain instream flows should be investigated and promoted. A resource library which contains information about agencies involved in controlling wildlife and recreation activities should be developed.

2. Regulations of pest control methods must be flexible enough to meet local needs.

Better education should be provided to all age groups to increase their knowledge about the availability of public land, and about the proper etiquette on private land, including awareness of litter and trespass laws.

4. Adequate public land must be made available in popular recreation areas to satisfy demand and to reduce recreational use of private land. In addition, recreation sites should be developed to help reduce energy problems — for example, sites should be able to accommodate longer stays and to meet more localized demand.

5. To insure that the wilderness designation of public lands does not seriously hamper agricultural and industrial productivity, a review should be carefully but expeditiously carried out. In time of national emergency wilderness areas should be available for expanded use.

6. Greater cooperation is required between all government agencies involved in enforcement of wildlife and recreation regulations. Jurisdictional inconsistencies existing between state and federal land (including tribal lands) undermines enforcement efficiency. These should be reduced.

7. Methods should be established, i.e., tax incentives, professional assistance, to encourage the private landowner to maintain quality habitat and allow public recreational use.

PROBLEM NO. 10 — WASTE DISPOSAL

Recycling of resources and manufactured products is not receiving enough serious consideration from industry and from consumers. Recycling could reduce energy use, pollution, and consumption of resources and land by reducing the amount of waste. But too little recycling is in practice.

Chemical and unrecycled solid wastes are an increasing threat to the health and welfare of the entire state.

Recommendations

Through extension homemaker clubs and other consumer groups encourage a change in attitude in many people to recycle as much useable household waste as possible.

2. Recycling of metals and paper should be encouraged through deposits,

refunds and taxation.

3. Encourage strict enforcement of state health laws related to waste disposal.

Communities should develop comprehensive plans for safe disposal procedures for chemical, atomic and solid waste. No sites should be opened until all safety criteria are met.

We should encourage conversion of as much solid and municipal waste to energy and fertilizer as possible.

6. Industry should be encouraged to institute, within an equitable time period, recycling of container products that they manufacture.

7. We should encourage recycling by industry of chemical and other industrial wastes.

HOME
ECONOMICS

CHAIRMAN
y Poush, Lewistown

ICE-CHAIRMAN
l Frasier, Cut Bank

This report includes problems and concerns discussed at counties, districts and then combined at the state meetings.

PROBLEM NO. 1 — FAMILY

Our foremost concern is for the problems of the family because almost everyone belongs to a family unit from cradle to grave. Many families find themselves in stressful situations trying to cope with the anxieties of changing lifestyles which we have not yet learned to understand.

Specifically, some of the problems are due to: economic pressures, changes in moral and spiritual values, a lack of decision-making skills, and high mobility of our society, inability to understand and deal with family violence, single parent families, negative self-images, teen-age pregnancy, a lack of family discipline and cohesion, encroachment of television on family time, and two-career families. In addition, there is a lack of training to help people develop communication skills as well as to help them prepare for marriage, parenting, and retirement.

Recommendations

1. Promote recreation for the entire family.
2. Encourage businesses to offer family discounts for movies, athletic events, stage plays, etc.
3. Encourage family leaders to select television programs, letting the family itself do the selection.
4. Offer programs on family life through mass media.
5. TV programs unsuitable for viewing by children could be reduced by writing letters to the networks requesting changes.
6. The effects of excessive television viewing by children could be more widely publicized.
7. By implementing more family-related activities, children's television viewing could be reduced.
8. Strengthen moral values and fulfill spiritual needs by promoting family involvement in church activities. .
9. Encourage families to discuss values for its own clarification.
10. Encourage families to set their own priorities and roles.
11. Time management should be worked out and taught within the family.
12. Encourage children to learn the principles of work, through working within the family, and by examples set in the family.
13. Provide instruction to parents in the skills and knowledge needed to enable them to feel comfortable teaching sexuality and moral values to their children.
14. Offer instruction to parents on how to develop and maintain behavior guidelines, example setting, and integrity.
15. Encourage having a specific family togetherness time regularly, as once a week.
16. Quality child care centers should be made available to families which need to make use of them.
17. Courses on parenting should be made available to all adults and young people through schools, churches, adult education courses and county health departments.
18. Family life and communications courses should be made mandatory in schools for grades K-12.
19. School board members should be educated to accept and encourage the development of family life and communications courses in the schools.
20. Begin drug and alcohol information and education in primary grades and continue throughout the school years.

Encourage family life courses in school for pre-adolescents through high school.

Provide money management and budgeting courses through adult education, Extension programs, and family life classes, as a means of reducing one of the major sources of family stress.

Premarital and postmarital instruction for couples should be provided to help them plan and cope with the adjustment problems of marriage.

Encourage marriage enrichment education for couples through mental health facilities and churches.

Promote the teaching of skills to improve the self-image of the individual and family through clergy, mental health associations, adult education and home economics courses, school counselors, and Extension Homemakers.

Encourage the use of the elderly to serve as resource people within the community, as in 4-H clubs, schools, churches, Scouts, Adopt-a-grandparent efforts, block parents, and Big Brothers and Sisters programs.

Mental health centers, the county health department, and other agencies should offer programs in positive, constructive stress management.

Utilize all available county Extension programs and resource people involved in quality of personal and family life.

PROBLEM NO. 2 — EDUCATION

Education for life is a continuous process and in our modern society cannot be entirely left to the technique of experience, to "learning by doing," as it once was. Some of the specific problems are a lack of communication between instructors and parents, lack of vocational skills, difficulties peculiar to single parent families, unwise use of leisure time, the need for appropriate recreation and cultural enrichment. Communities are slow to assess the need for facilities and instruction to keep adults updated in skills and understanding. There is also some lack of instruction in basic living skills and in career planning.

Recommendations

Encourage people to take a more active part in school policy-making by attending school board meetings and parent-teacher conferences.

2. Inform the school board of the community desire to return to the teaching of basics.

3. Encourage school boards to re-examine their policies regarding tenure, competency and teacher screening.

4. Promote a greater consideration in school districts of pre-school children, kindergartens, and adult education extension classes.

Encourage high school classes for teaching employable skills to youth and adults, as well as having vocational training at the colleges and Vo-tech centers.

6. In schools, place a stronger emphasis on academics than on extra-curricular activities.

Encourage teachers to provide information about career and job opportunities in each of their classes.

Encourage citizens to take advantage of the educational opportunities available, and to take part in helping the school plan for new and broader opportunities for students.

Make educational television available to all areas.

Give more support to home study, such as correspondence courses for credit, and for credit through Extension Service programs and through units of higher education.

Work to establish a course in family living as a required study in grades K-12.

Provide for services of a professional home economist in every county on a full-time basis, or through contract services.

Facilities and instruction should be provided for updating vocational and leisure time skills, cultural arts and physical fitness.

Counseling and training should be offered to displaced homemakers and single parents to help them assume a new place in our society.

Better opportunities should be provided for the gifted and for those with learning disabilities.

Make use of senior citizens as continuing education teachers.

PROBLEM NO. 3 — ENERGY

Energy conservation efforts have established that there is a resistance to changes in lifestyle. We need continued research in energy alternatives and energy-conserving techniques within and outside the home. Energy sources are limited and alternatives are few at this time. Stewardship of natural resources, land use, and environment is essential now and for future generations, and should be promoted.

Recommendations

Encourage families to create a planned approach for developing energy-conserving habits and using energy-saving devices, such as acquiring more and warmer clothing, using wood stoves, recycling, car pools, and using public transportation.

Encourage the news media and educational TV channels to provide information and programs that encourage the uses of alternate forms of energy such as passive heat, active solar heat, gasohol, coal, wind, water, biomass, geothermal sources, and more underground construction for insulation.

Encourage the public to exert pressure on industry to save energy by reducing the usage of neon signs, throw-away products, open display refrigerators, and "planned" obsolescence.

Encourage consumers to pressure the manufacturers to develop energy-efficient products voluntarily and without a mandate from the government.

Encourage shelterbelt plantings around rural homes.

Information on how to cope with the shortage of energy is available, but methods are needed to assist people in acting on this information.

7. Encourage utility companies to make widely available interest-free loans for home improvements to conserve energy.

Provide more information and education to the public concerning the cost of producing goods and services, and the cost of packaging, all which add to increased use of energy.

Encourage communities to make efforts to provide public transportation and encourage the use of it by such plans as having mini-buses travel between communities, designating central points for car pools, and building bike paths.

Encourage communities to coordinate community activities in order to make it possible for people to adjust their personal activities to help reduce fuel consumption.

Encourage authorities to enforce the laws pertaining to the use of streams, lakes, other bodies of water, air, land use, and of all the natural resources in the state.

12. The spread of noxious weeds should be given more concern and action by the appropriate agencies, by the legislature, and by the public.

PROBLEM NO. 4 — ECONOMIC MANAGEMENT

A soaring inflation rate, the high cost of energy, easy credit, and the family's

failure to distinguish between needs and wants make it difficult for families at all economic levels to manage their financial resources. Factors compounding the problem are: limited consumer skills and knowledge about budgeting, investments, insurance, basic decision-making, estate planning, retirement planning, and savings. Public policies and attitudes encourage financial over-extension and high energy consumption lifestyles. The media foster social attitudes that influence the family to believe that materialism equates with quality of life. There is a lack of knowledge of cost effectiveness, consumer protection laws, and consumer education aspects of food, clothing, appliances and other home-related products.

Recommendations

1. School systems should sponsor adult education classes on consumer topics.
2. Mandatory consumer education classes should be instituted in grades K-12.
3. A consumer education mobile unit should be provided in counties or areas.
4. The governor should proclaim a statewide consumer education week.
5. Mass media education should be accomplished through 30 second, 60 second, or half hour presentations on radio and television, and through ads and articles in newspapers.
6. Educational study packets for clubs and individuals should be provided.
7. Consumer education programs on cable television should be more widely used.
8. Educational programs are needed on coping with television commercials.
9. Consumer education camps or fairs for youth should be held.
10. County "consumerama" workshops, fairs, and displays should promote consumer education.
11. The state or counties should offer scholarships for studying consumer education.
12. Communities, counties, or areas should establish a toll-free hotline for consumer complaints.
13. A consumer advocate should be established in state government.
14. Financial counseling services should be established in each county.
15. Consumer Information Centers, such as the one at Pueblo, Colorado, should be promoted.
16. All kinds of agencies should be encouraged to include consumer news in their newsletters and to display such items in their offices.
17. Cassettes on consumer topics should be made available for loan by agencies.
18. Point-of-purchase information on consumer products should be provided.
19. The Extension Service should provide more pamphlets on consumer topics.
20. The Extension Service should develop home study courses in consumerism.
21. An Extension Home Economist should be provided for every county.
22. Classes and information on retirement should be provided by businesses.
23. Patterns for clothing for the handicapped should be developed.
24. Persons going through bankruptcy or being tried for writing bad checks should be ordered by the judge to participate in financial counseling sessions.

PROBLEM NO. 5 – HEALTH

Distance to medical care is a serious problem for some Montanans. A lack of care results from people not taking responsibility for their own education and safety, and from inadequate distribution of doctors, emergency medical technicians, and paramedical personnel. There is neglect of immunizations for preschool children. The cost of health care is prohibitive to some families. Very little use is being made of information on physical fitness, preventive health care, prenatal care, family planning, and home health care for the elderly.

There is a problem with the illegal and legal use of alcohol and drugs in all sectors of the population. Domestic violence is a big concern. Our lifestyle, and a lack of communication and understanding, has led to unmanageable stress within some families. Too few people are aware of the facilities and services available for mental well-being. Other concerns include loneliness, negative attitudes, and coping with death.

Recommendations

Equipment duplicated in medical centers should be consolidated.

Helicopter ambulance service should be available to all communities.

A home health care program should be established for all communities.

Many areas need a mobile health unit.

Efforts should be made to see that every community has the services of a school nurse or a public health nurse.

6. To secure the services of a physician, localities could provide scholarships for students to attend medical schools and then return to the community.

Coordination between helping agencies should be improved.

Education classes should be established in emergency medical training, first aid, CPR, substance abuse, and prenatal care.

First aid and CPR classes should be made mandatory in high schools.

Parent involvement in school programs on substance abuse should be promoted.

The media should do more to educate persons on available medical services.

More education for law enforcement officials should be provided regarding chemical substance abuse.

Teachers should be required to take courses on substance abuse, identification of drugs, and how to handle students on drugs.

On-the-job safety classes should be instituted.

Health education study packets should be provided.

A free hotline for health-related questions should be established.

Research should be promoted in infant mortality and prenantal deaths.

A statewide network for referral services and medical information should be established.

19. A "vial of life" program should be established in all counties.

Water quality in rural areas should be checked frequently.

21. Efforts should be made to enact stricter laws and to provide for better enforcement of laws regarding the dispensing of prescription drugs.

22. Legislation providing for the practice of medical para-professionals in Montana should be promoted.

Greater attention should be given to everyday practical living difficulties of the handicapped.

The issue of violence in the family should be discussed in each county, including abuse of children, spouse, and the elderly. Reporting known or suspected abuses should be encouraged, as well as encouraging educational programs. Counseling or group therapy for abusers should be made available.

PROBLEM NO. 6 — NUTRITION

The public is less knowledgeable than it needs to be concerning nutrition. There is an inadequate understanding of how to combine foods for a health-promoting diet, or of nutritional principles. Education is needed about changes in food habits created by new products; methods of food production, purchasing, preparation, storage, and preservation; changing attitudes in living patterns; and mass media advertising. People lack nutritional skills to help them through life, especially in the areas of prenatal care, diets for specific age groups, living alone, or on special diets. Health hazards are sometimes increased by the unwise use of food, for example, by the use of supplements, fad diets, and highly processed convenience foods.

Recommendations

1. Accurate information should be provided to the public on nutritional values and food preparation through the radio, newspapers, billboards, with special attention given to those persons of elementary school age up through adulthood.
2. Citizens should be encouraged to respond to the food assistance programs such as WIC, EFNEP, food stamps, hot lunch programs, etc. School lunch personnel should avail themselves of nutritional training whenever possible.
3. Information and training should be made available to homemakers to help them with meal planning alternatives, many of which can lower cost, be acceptable, and still provide proper nutrition to the family.
4. Workshops and seminars should be conducted to inform interested persons in gardening, utilization of home grown food, hydroponic gardens, freezing, smoking, canning, drying, and about all kinds of food preservation skills. Courses should also be conducted to provide information on the use of chemicals and additives in food including the excessive use of sugar, salt and vitamins. Such courses should be offered to all ages.
5. Efforts should be made to utilize knowledgeable local resource people to teach nutrition at clubs, meetings, school activities, and fairs.
6. Nutrition education should be made a required study in grades K-12.
7. Junk foods and snacks should be replaced by nutritional foods at school and at home. An example would be fruit juice breaks at school.
8. Re-evaluate all youth programs and food-nutrition projects to be sure they include adequate information on the nutritional value of the foods as well as on cooking techniques.
9. People using the government's supplemental food programs should be required to have counseling by nutrition professionals or to attend nutritional consumer education programs. This would teach buying skills and nutrition information.
10. Special emphasis should be given to nutritional education for the elderly and for women who are considered high risk pregnancy cases.
11. Elementary age students, mothers of preschool children, pregnant and lactating mothers should all be encouraged to take part in education for better nutrition.
12. Medical students and prospective teachers should be required to take nutrition classes as part of their curriculum.
13. Communities should help people realize that there is a great opportunity for savings and for improving nutrition by using the co-op farmers' markets.
14. Communities should assist elderly persons who may not be eating properly by having such programs as the Meals on Wheels, community meal-sites, and by making the school hot lunch available to them.

PROBLEM NO. 7 — COMMUNITY

Within Montana there is a great diversity of family-related needs. In some communities and areas there is a void of services and programs. Some of the basics in the problem are: little coordination between agencies and programs, and a lack of knowledge by citizens about the availability of programs and services. There is a failure to utilize the talents and skills of people in the community, especially of the elderly and the young. There is also a failure to get the most use out of existing facilities such as schools, gyms, community halls, etc. There is little volunteerism, and the community-minded neighbor seems to be increasingly rare.

There is a lack of planning about future energy requirements and industry and the need for additional services and new businesses. Patronage of local businesses is not encouraged. There is a shortage of adequate housing for all segments of most communities. Recreational facilities for all ages also seem to be lacking in some communities. People are not aware of how to disseminate information within the community, or how to get it.

Recommendations

A list of all community and governmental agency resources should be compiled and made public.

2. Better opportunities should be provided for the handicapped in most communities.

An effort should be made to promote activities that will include youth, single people, newcomers, physically and socially handicapped persons.

4. Planning boards should be created to help plan for orderly housing development and in order to protect prime lands, provide for roads, road maintenance, snow removal, fire protection, as well as to help look ahead and plan for the influx of people.

Public understanding of law enforcement should be improved, and activities provided wherein the police will develop a friendly relationship with young children.

Attempts should be made to increase community pride through a clean-up campaign.

Communities should give more encouragement to people to become good neighbors. Special attention should be given to newcomers.

Recycling or collection centers should be established in every community, and people encouraged to use them.

Markets for local commodities should be set up and people could be encouraged to buy locally.

Greater effort should be made to convince people of the wisdom of supporting local businesses whenever possible.

11. During non-school portions of the year, the school facilities should be made more widely available.

12. Institutional buildings should be shared with the community.

13. Most communities have need for and could provide for more facilities such as parks, swimming pools, ball parks and playgrounds.

Youth and elderly could be involved in the life of the community by thoughtful matching of needs and skills.

PROBLEM NO. 8 — GOVERNMENT

The way the average citizen views his role in government is not conducive to good government nor to citizen satisfaction. Some of the specifics in this problem are caused by the mobility of society. A lot of people don't feel they are part of their community. In some cases, red tape and regulations have spawned a feeling

of frustration and irritation with all levels of government. The fact that agencies are often not very well coordinated leads to further frustrations. The cost effectiveness of government programs and agencies is not understood. Lack of skill on the part of the people is preventing them from becoming effective in public policies, especially in affecting legislation.

Recommendations

In order to develop community and national pride, we should strive to support programs that place emphasis on patriotism, heritage of community and state, and a feeling of ownership.

Communities should promote education through classes and discussions on the workings and functions of local, state, and federal governments.

Citizens should take opportunity to become effective in the legislative process. We should be willing to contribute time and effort in public programs such as open forums organized to examine and evaluate public policies in agencies, including the cost-benefit ratio of such policies and preparing for changes in local population.

4. Be willing to serve in political offices.

Agencies should establish communication systems of interagency referral, community resource board, and directories of all agencies.

This report includes problems and concerns discussed at counties, districts and then combined at the state meeting.

We feel that it is important to emphasize that there are many good aspects in the lives of youth in Montana today. These include thousands of outstanding youth, youth programs, and families who have support from other adults and communities.

Working toward solutions of the following problems will help make the coming years more fulfilling for the youth of Montana.

PROBLEM NO. 1 — FAMILY

The family structure has deteriorated due to the following situations. Young people upon becoming adults, enter into home and family responsibilities without an adequate understanding or knowledge. Youth are experiencing strains with the family, because of teenage pregnancies, single parent families and working mothers. Communication is also lacking within the family unit. Families are not participating in activities together. Parents lack sufficient knowledge to relate and to teach their children about alcohol, drugs, sex education, etc. TV is abused and has poor quality programming.

Recommendations

A cooperative effort should be made between families and schools to train youth better before they enter into home and family responsibilities. This can be accomplished through expanding the school curriculum to include family life courses and adult/youth counseling.

Parents should be given the opportunity to take advantage of a continuing education program which relates to the eventual training of their children with respect to alcohol, drugs, and sexual abuse.

A continuing effort should be made by youth and parents to maintain open lines of communication within family unit. This can be accomplished through a coordinated effort at family, school and community level by encouraging parent-youth participation at all levels of interest.

A concerted community effort should be made to expand the availability of educational television, resulting in better quality programming.

PROBLEM NO. 2 — COMMUNICATION

Some parents don't understand or are unwilling to accept parental responsibilities, and this results in their failure to communicate the following: self-esteem; family values; the acceptance of responsibility for actions; respect for law, property and rights of others; ability to handle social pressures.

There is a failure to employ appropriate and consistent discipline. Available parental time and positive attention is limited or lacking.

Recommendations

1. All members of the family should be provided additional educational opportunities in the areas of motivation, self-esteem, communication, active listening, positive and consistent discipline, and attitudes of cooperation. Use of a few recommended ways for bringing this education about are the use of local news articles and TV spots, workshops for various community groups, human relations camps, games for recreational activities designed for the entire family, adult education classes, and public and private school classes.
2. Families should encourage their community to support the family unit by establishing a family night on which other activities are not scheduled.

PROBLEM NO. 3 — SCHOOL SYSTEM

There is a lack of communication between parents, administration, and students regarding the expectations that each has of the other. There should be a better balance between varsity athletics and academics within the school. There is little recognition of the "average" student who excels neither in sports nor academics. Schools are failing to meet the changing needs of students in such areas as sex education, practical living skills, drug and alcohol education, career and vocational education, and personal counseling. The result often is student apathy and, in larger communities, junior high and senior high school drop-out rate. Peer pressure among students is also a problem, leading to all kinds of undesirable social behaviors. Small schools are finding it very difficult to comply with certain government regulations. All schools are affected by government legislation involving tenure, funding, etc.

Recommendations

Schools should place more emphasis on the basics: reading, writing and arithmetic.

Schools should provide additional and supplemental classes for the gifted.

3. A concerned citizens group should be formed, including youths, parents, teachers, and other interested community people. This committee would advise shcool administrators and work with them on problems and concerns of schools and youth.

There should be more opportunity for personal counseling of students.

5. State regulations should be tailored to fit the different sized schools.

6. Wherever the small size of a school is causing problems, consolidation should be considered.

7. The local community and the state should look into additional ways of financing schools.

8. There should be an improved and more honest system of teacher evaluation including student input.

9. Each school should have a yearly evaluation of school curriculum to give consideration to current youth-related problems, the changing needs of youth and the extracurricular activities program. Student input should be included.

Both parenting and sex education classes should be required and taught at the junior high school level. Sex education should be required and taught at the lower grade levels.

Teacher training institutions should do a better job of training secondary teachers to understand and deal with emotional problems of the adolescent.

12. Inter-scholastic competition should be limited to the 9th grade and above. Intramural activities should be emphasized for grades 8 and below.

13. Teachers and schools should provide greater recognition for students in many different areas, including individual recognition in the classroom.

14. Schools should provide more funds for non-athletic, extracurricular activities.

15. State regulations should be amended to require smaller class sizes in junior and senior high school.

A program should be developed and implemented to increase the participation of the presently uninvolved student. This should include peer counseling programs in junior and senior high schools under the supervision of school counselors in order to reach many shy and uninvolved students.

There should be better alcohol and drug education programs provided for all students, dealing with the realities of the drug and alcohol situation, not just factual textbook material.

There should be career awareness programs to inform students of the

many possible opportunities available to them.

19. A voting high school student should be included on the school board.

20. Schools should provide a youth activity day when various representatives of youth groups can set up booths and present their programs to all students. This would include such groups as 4-H, FFA, Girl Scouts, Boy Scouts, Junior Achievement, Young Life, etc.

PROBLEM NO. 4 — ALCOHOL AND DRUG ABUSE

There are increasing problems with use and abuse of alcohol, tobacco and other drugs by youth and adults. Both the family and society are adversely affected.

In many cases the use is accepted or ignored until a tragedy of some kind takes place.

Some of the contributing factors are lack of respect for family members, lack of self-esteem, media influence, peer pressure, poor examples by adults, and lack of moral training.

Current methods are not meeting the need for preventive education.

In face of these situations, concerned people who are trying to do something about the problem are meeting with frustration and disillusionment.

Recommendations

1. The public should support programs being introduced in the schools (grades 5-12) dealing with feelings, peer pressure, etc., and allow students to participate in the planning. The programs should be understood by the students and meet their needs.
2. Complete and extensive studies should be made as to why students use alcohol and drugs.
3. Encourage youth to take part in the responsibility of policing themselves and in participating in youth counseling programs.
4. There needs to be classes or other educational forums for adults and youth concerning the emotional aspects, effect and related problems of alcohol and drug abuse. Develop an awareness of existing programs.
5. Based on complete and factual information, people should develop better verbal communication between parents and youth about feelings on use and abuse of drugs and alcohol.
6. Communities should permit better enforcement of existing laws and should establish a court permitting students to be involved in school-related youth problems.
7. There should be a continued and vigorous effort to bring about more positive media influence.
8. We should involve the youth and the adults in a positive way in planning youth activities.
9. The state should raise the drinking age and exclude under-aged youth from bars and taverns.
10. We should make private counseling available, especially in rural areas.
11. Schools could provide youth centers for eating and for recreation in all communities.

PROBLEM NO. 5 — EMPLOYMENT

There is a lack of adequate employment opportunities for youth due to age and wage laws, OSHA and poorly directed government programs. State and federal agriculture laws are obstacles to continued family farming.

There is a lack of respect toward the real world of employment and youth have not been taught the desirability or rewards of working.

There is a lack of career counseling and economic training to help increase opportunity for the inexperienced and untrained youth.

Recommendations

1. Existing government regulations affecting youth employment should be revised to better meet the needs of youth and communities. These regulations should be based on youth needs and capability, rather than strictly on the income of the family of the youth.

2. A cooperative effort between schools and local businesses should be made to develop basic work skills and desirable attitudes and opportunities.

School curriculum should be expanded to include effective career training and counseling courses.

4. Laws should be reviewed regarding age and wage requirements for youth in an attempt to make employment more available.

PROBLEM NO. 6 — COMMUNITY INVOLVEMENT

There is a lack of cooperation between all units involved with youth within a community. There is too little coordination in use of time, facilities, funding, volunteers, programs of recognition, communications and leadership training.

Youth are not allowed or encouraged to participate on community boards, governing bodies, etc., which are determining youth programs.

There is apathy and lack of interest among adults, parents and youth with regard to youth programs, problems of youth and adult leadership.

There is a lack of cultural awareness between urban, rural and ethnic groups.

Recommendations

We recommend the establishment of a Community Education Program, either on a county or community basis, in order to utilize resources of an entire community. Such a community education program stresses development and the strengthening of the relationship, mutual dependence, and basic linkage between home, school and community in all phases of human growth.

We would like to see more programs encouraging senior citizen involvement with youth.

3. The Big Brother-Big Sister Program should be continued, expanded and supported.

A list of available leadership resources in various areas, together with a list of leadership needs should be developed, and made available.

We recommend an attempt to involve all media in a massive awareness campaign about problems and the needs for community development. Also, they should be asked to aid in recognition of volunteer and youth achievement.

Concerned citizens groups should be created to solve community problems. All age groups should be represented. Training should be offered to volunteers.

We should provide leadership training for all volunteer groups.

Youth must be informed about the recreational facilities now in existence, and must be included on planning boards where decisions are made that affect them. Allow them to demonstrate their good judgement.

9. The Youth Exchange Program between urban and rural youth should be continued, expanded, and supported.

PROBLEM NO. 7 — LIVING SKILLS

There is a lack of education in many basic living skills which are becoming

more necessary in our complex society. Some problems that young people encounter are caused by lack of preparation in parenting, marriage and family life, money management and credit use, human interaction, consumer education, understanding energy conservation, and about nutritious diets.

Recommendations

Youth must be introduced at an early age to the process of decision making, communications, role of parents, money management, and nutritional habits. This can be done both in the home and in the schools.

A strong education program in reference to life survival skills should be taught in the schools. Teacher training institutions should offer courses in management.

Youth need to be made more aware of the opportunities available around them.

PROBLEM NO. 8 — RECREATION

In many communities youth have a feeling there's nothing to do.

In some communities the recreational facilities of teen centers, parks, swimming pools, etc., are non-existent, inadequate, or quite unattractive.

In some cases where facilities exist, they are not effectively serving the community because of poor communication as to what is available. People are therefore not making use of these facilities, and have no feeling of responsibility toward them.

Recommendations

Assess what is available, determine what the community needs and wants and encourage full use of existing facilities, including public buildings.

2. All youth and adults should make a concerted effort to increase cooperation and communication between the community and youth organizations. People should make their homes available for lodging and encourage car pooling or use of school bus.

Involve youth in a meaningful way in planning, development, management and funding of recreational facilities and programs.

More family-oriented recreational opportunities should be developed. Encourage a "one night a week for families."

Make youth aware and encourage them to participate in unstructured recreation such as hikes, swimming, etc.

6. School activities should be organized in such a way as to create an interest in hobbies and lifelong activities should be introduced to children by the time they are eight years old. Lifelong activities should be organized in such a way that they would include all ages, including the assistance of senior citizens to teach the youth.

7. Efforts should be made to develop more "year 'round" facilities for recreation.

PROBLEM NO. 9 — MORALITY

Youth do not understand, and therefore, need help to cope with the changing lifestyles and moral attitudes of parents and others in the world around them.

There is a decline in moral values due in part to a lack of parental interest and slackening interest in faith and spiritual values.

The existing double standard of behavior between adults and youth is making it more difficult to encourage high moral standards.

Recommendations

1. Parents should set a good example of responsibility to the family and to their community.

Positive media influence such as the ads on families and children should be directed by some churches.

We should encourage the development and use of moral TV programs, movies, music and books.

4. Parents should promote a single, as opposed to double, standard of behavior for youth and adults.

Churches should be asked to promote and support youth groups within the church as well as outside of it. Examples are Young Life, Goods News Clubs, 4-H, Boy Scouts, Girl Scouts, Campfire.

Churches should provide workshops for parents to aid the church and family in teaching morality.

7. More ministerial family counseling services should be established.

Youth should be given solid facts about cults and cliques and should be discouraged from becoming involved with these.

PROBLEM NO. 10 — LAW ENFORCEMENT

Law enforcement concerning youth is sometimes inconsistent and inappropriate, and at times is biased toward family reputations.

Individuals and communities are not involved in law enforcement.

There is a lack of shelter facilities such as foster homes, attention homes, crisis centers, and after-care centers.

Juveniles are committing a disproportionate and increasing number of crimes.

There is a lack of communication between the community and all areas of law enforcement.

Recommendations

1. Law enforcement agencies must interpret and enforce the law as it was intended, allowing for equal treatment for all persons.
2. Youth should be included on a community advisory board that deals with juvenile offenders.
3. We should increase community awareness and funding for shelter facilities such as attention homes, foster homes, crisis centers and after-care centers.

Law enforcement personnel should develop an extensive public relations program resulting in better communication between youth, adults and law enforcement officials.

More public input should be utilized in law enforcement procedures.

PROBLEM NO. 11 — SOCIAL PROBLEMS

There is an increase in a variety of social problems and a lack of understanding of them. These problems include child abuse, neglect, incest, teenage pregnancy, suicide, social disease, mental illness, vandalism, and violence.

Recommendations

Professional help should be provided on a 24-hour basis and a crisis line be established.

A public awareness program to appraise people of help available should be established.

TV commercials promoting good family relations should be continued and encouraged.

The Big Brother-Big Sister Program should be encouraged.

Communities should develop a counseling program involving youth assistants who have been trained to spot problems.

6. Communities should have a crisis center, foster homes, group homes, etc., where parents, abused wives and youth could seek shelter and help.

Juvenile authorities should encourage youth to take part in the responsibility of policing themselves.

Sex education should be provided at an early level for both boys and girls. Counseling is more effective at a later date.

A courtship and marriage course at high school level should be taught.

PROBLEM NO. 12 — THE MEDIA (TV, MOVIES, MUSIC, BOOKS)

The media gives too much attention to the negative, and too little attention to the positive. There is little parent/child communication and guidance. A lack of educational TV is seen as a problem.

Excessive media exposure is resulting in youth developing unrealistic expectations of the world around them.

Recommendations

Media should be encouraged to put more emphasis on the positive activities the youth do rather than on the negative.

Adults should give more guidance to youth in selecting mass media.

Better use of leisure time should be encouraged to counteract unrealistic expectations that are being developed through poor mass media content.

Better use should be made of the Public Broadcasting Service and mass media to increase awareness about parenting skills, family relationships and communications.

Concerned citizens should encourage the legislature to support educational TV for all Montana.

PROBLEM NO. 13 — HEALTH

Many smaller communities suffer from a lack of doctors and health facilities, with difficulties to both youth and families.

Recommendations

Emergency medical training on a continued basis should be included in junior high and high school curriculum to better protect people in isolated rural homes and dwellings.

Recruitment of medical personnel should be a community priority.

COMMUNITY DEVELOPMEN

CHAIRMAN
Dee Storm, Forsyth

VICE-CHAIRMAN
Howard Lyman, Great F

This report includes problems and concerns discussed at counties and districts, and then combined at the state meeting, in order of priority.

PROBLEM NO. 1 — ENERGY

The present high cost of energy is taking a toll on all segments of our society: Conventional home heating fuel and electric costs have skyrocketed, bringing economic hardships to families and senior citizens. Current federal regulations are setting the price of domestic fuel, and thus there is little incentive or emphasis on developing alternate energy resources. Increased use of coal, wood stoves and fireplaces are adding to the chances of having more air quality problems. Many of our communities are also suffering from added impact of energy development activity, as regards people and services.

Recommendations

1. Encourage programs of energy conservation at all levels in private industry and business.
   a. The Extension Service should be encouraged to work with other agencies to inform people about energy conservation in their homes, farms, and businesses.
   b. Further renovation and weatherization of public buildings and schools should be planned and funded.
   c. We should encourage the use of Coal Tax Funds for low interest loans to help conserve energy in local government structures and machines and for institutions in lieu of out-of-state investments.

2. There should be research and development of small scale energy projects such as hydro-electric plants, ethanol production from wood, sugar beets and grain, both active and passive solar units, and from solid wastes and certain by-products.

3. Part of the taxes generated from natural resource development in the area should be used to meet the community's financial needs resulting from rapid influx of more people in a "boomtown" situation.

PROBLEM NO. 2 — TRANSPORTATION

Montana's large size and small population make the need for an adequate and efficient transportation system a necessity. Road, rail, air and water transportation alternatives should all be encouraged with the priority given to the most efficient method. Updating railroads and highways in Montana should be related to enhancing the economy and having efficient transportation.

Recommendations

1. Services of the Milwaukee Railroad should be maintained.
2. Amtrak service in Montana should be reinstated.
3. Shippers should encourage containerized shipping units, subterminals and unit-train loading facilities.
4. Street and road plans should include bicycle and pedestrian paths.
5. Barge transportation on the Missouri and Yellowstone Rivers should be studied, as this is a most economical system.
6. The Montana Highway Commission should consult with county commissioners on local problems.
7. Montana's transportation dollars should be spent on those methods of transportation that will return the greatest return to the state.
8. County transportation authority should be organized where feasible.

PROBLEM NO. 3 — COPING WITH GROWTH

Montana has experienced and will continue to experience population growth that results in the subdivision of more land as a result of several factors. These include natural resource development (especially energy development in the eastern half of the state), suburb annexation on the fringes of our cities, recreational homesite development, in-migration, and natural population growth.

As a result, historical, cultural and social values are eroding, agricultural lands are being taken out of production, and taxpayers are being forced to pay for additional capital improvements and services. In addition, wildlife habitat is threatened and more waste disposal problems are occurring.

Community planning efforts are not strong enough to wisely influence growth, especially rapid growth. Also, state and federal planning efforts threaten to overshadow local planning, and many communities have not developed long range comprehensive plans to guide future growth.

Nor are new housing and subdivision designs as energy efficient as they could be. Further, landowners in new subdivisions often don't assume full responsibility for the cost of the new improvements and services.

In rapid-growth situations, methods have not yet been developed to insure that financial resources for capital improvements will be directed to an impacted community. There is no consistent state or local policy requiring the developer of new industries to share in the costs of providing housing, public services and facilities for the new employees.

Recommendations

Encourage the establishment and continuation of active Planning Boards made up of concerned citizens who are willing to work closely with elected officials. Counties which have not already developed long range comprehensive plans should be encouraged to do so, since these plans help identify goals and guidelines for future growth and help communities qualify for impact related assistance.

2. Rewrite the "Green Belt" law to make it an effective means of preserving agricultural lands around cities. Tax incentives should be developed to encourage the subdivision of non-agricultural lands, and to leave fertile farm land for agricultural use.

3. Support state legislation that would facilitate the establishment of special improvement districts and special service districts to assure that the cost of developing capital improvements and public services will be borne by developers and new residents, not taxpayers already living in the area.

4. Energy efficient subdivisions and housing designs should be promoted by planning boards and county commissioners. These should include multi-family "common wall" dwellings, single family dwellings that utilize solar technology for heating and cluster development units.

Leap frog developments should be discouraged since these create problems of providing adequate services. In general, subdivision development should be contiguous to existing cities.

6. Support existing legislation that prohibits development in flood plains, on steep slopes, and in areas critical for survival of wildlife.

7. In rapid growth situations created by a new industry, the industry responsible for the growth should be at least partially responsible for providing housing, public services, and capital improvements.

Communities should encourage orderly growth by promoting small businesses and industry that would provide local jobs and would not disrupt lifestyles.

PROBLEM NO. 4 — GOVERNMENT

There is an excess of governmental activities, including duplication of services, lack of communication between agencies and the public, overly complicated directives and too much red tape. Further, the government is not always responsive to the people.

Recommendations

Encourage the consolidation of services of local governments, where feasible and acceptable.

Communities should encourage leadership training at local levels of the KEEP-type programs in order to develop confidence and skill.

Encourage all elections to be held at the same time to eliminate the multi-costs from operation wherever possible.

4. Encourage legislative action to require legislators to review regulations imposed by many state administrative departments and to empower oversight committees to strike out regulations that are contrary to the intent of the law.

PROBLEM NO. 5 — ECONOMY

Montana's economy is based on relatively few industries, namely agriculture and natural resource development. New industries are not encouraged to develop by tax incentives or other means. General economic conditions are forcing the closure of many small locally-owned businesses and farms while Montana investment dollars and commodities continue to flow out of state. There is a lack of coordinated effort toward an orderly economic growth over a long period of time. We appear to operate on a crisis basis, hopping from one industry to another to support the economy.

Recommendations

1. We need to encourage industry in Montana to process more of our raw material. We pay to produce it, we pay to ship it out, we pay to ship it back and we pay to buy the finished product. This is not best for Montana. By processing our products and finding new uses for our resources we could create new jobs, diminish part of our transportation problems, increase the tax base in towns where new industry locates, and provide a way for our investment dollars to stay in the state.

PROBLEM NO. 6 — EMPLOYMENT OPPORTUNITIES

Our young people, who have been raised with a Montana value system, are being forced out-of-state looking for employment.

The impact of some new industries on our environment and communities needs to be understood and plans made to maintain quality.

Recommendations

There needs to be definitive state-wide recognition, especially in state government, that agriculture is the basis of our economy. Other industries are important, of course, but we should promote most vigorously the one with the highest value to the state, and others to lesser degrees.

2. We would like to see tax incentives offered to encourage the locally owned industry. Inheritance taxes should be revised on the state level so that continuation of the family farm is not discouraged.

3. The people who continually oppose the development, diversification, or expansion of industry should be told "to either lead, follow or get out of the way."

There should be some form of management training available to local

business persons. The occasional opportunities now available are not always advertised or adequately promoted.

PROBLEM NO. 7 — PUBLIC INVOLVEMENT

There is a lack of public involvement due in part to a lack of education and communication about the responsibility of every citizen in a democracy. Too few citizens become involved in community betterment, starting with the family.

Recommendations

All elections should be held annually on one or two election days, and these days should be made holidays.

Public responsibility should be taught and practiced, starting in the first grade in all public schools.

Public Service television and the local newspapers should be encouraged to identify local issues.

Community action groups should be formed from the membership in all local service groups to identify and prioritize local problems and to invite local problem solving activity.

A uniform state system of rural addresses should be established.

All roads should be named and marked. All addresses should be included in local phone directories along with a map of the area.

PROBLEM NO. 8 — HEALTH CARE

In too many communities not even costly health services are meeting the needs of the public. Basically, in rural Montana, personnel in health care programs and facilities are few and far between. Health care services are fragmented and inaccessible to many people. Specifically there's a shortage of poor distribution of personnel and inadequate facilities, poor roads, and a lack of public transportation, inappropriate regulations, duplication of agency services, almost a total lack of self-help health education, and an inability of the average citizen to handle emergency medical situations.

Recommendations

1. Promote legislation to re-define the role of mid-level health care professionals, including nurse-practitioners, physician assistants and mid-wives; allow different standards for rural health care facilities and services as opposed to those developed for urban facilities and services.
2. Encourage the establishment of permanent and mobile primary care clinics in rural areas, staffed by nurse practitioners and other mid-level professionals.

Encourage all persons to support consumer health education programs in cooperation with established health agencies.

State agencies should promote state-wide and regional emergency service networks which provide a universal emergency phone number such as 911. Local ambulance programs and improved transfer services should also be encouraged. Training programs for the general public, in addition to that of Emergency Medical Technicians, such as standard and advanced first aid, first responder skills and cardio-pulmonary resuscitation, should be established.

5. Encourage cooperation between health care agencies to better utilize resources.

PROBLEM NO. 9 — PUBLIC SERVICES

The need for greater efficiency in government services is widely recognized.

Duplication of many services between city-county governments currently exists. Services such as fire protection, sewer, water, etc., are often inadequate or poorly coordinated.

Welfare programs do not fulfill their intent. Many inequities remain among the recipients of current assistance programs designed to help the underprivileged. The current welfare system often encourages able bodied individuals to live on welfare subsistence rather than in seeking gainful employment.

Recommendations

1. Wherever possible and practical, city-county joint financing and facilities should be maintained and operated for services common to both levels of government.
2. Encourage study of the possibility of having regional facilities serve more than one county for jail, solid waste systems and water projects.
3. Greater accountability of funds utilized by all levels of government for public service programs should be demanded.
4. The state should develop a system for prioritizing public services for the state of Montana, considering population density, availability of funds, geographical differences and needs.
5. Schools or agencies should conduct educational programs designed to help decision makers and other citizens understand federal and state regulations concerning solid wastes, sanitation, water quality and other public municipal concerns.
6. State government should conduct an evaluation of the welfare programs in the state of Montana, including the criteria for eligibility. Develop a system of repayment for those who are physically able to work.

PROBLEM NO. 10 — EDUCATION

Current patterns of allocating educational resources may no longer be appropriate. Special areas of concern are vocational education and training for employment, continuing education, information programs concerning living skills, consumer education, energy conservation, fiscal management, preventative health education, leadership training, multiple use of facilities including buses and negative quality television programming which competes for study time and family oriented activities.

Recommendations

1. Schools should develop more vocational-technical and apprenticeship workshop programs for on-the-job training. These should be available in all schools, and with the support and cooperation of local businesses and agencies.
2. Continuing education opportunities should be provided for all age levels. Local school districts should take advantage of the one-mill levy option to fund these programs.
3. School districts should promote greater use of school facilities and other educational resources by making them more available to the general community.
4. School boards and the Superintendent of Public Instruction should emphasize basic education skills, preventative health education and consumer education at all grade levels.

PROBLEM NO. 11 — WATER

Due to increased demands for water by agriculture, industry, municipalities, recreation, and out-of-state interests, it is possible that Montana may face water shortages in the future. We are not certain that adequate water supplies are re-

served for use by Montanans or that our water supply is of highest quality. The potential for industrial, municipal and agricultural sources of water pollution is also increasing.

Recommendations

1. To resist all proposals such as the use of slurry pipelines that would export our water to other states in a wasteful manner.
2. State and federal agencies (including Department of Natural Resources and Conservation and the Cooperative Extension Service) should continue their educational efforts to inform all water users about filing water claims under S.B. 76.
3. We should encourage EPA and local officials to clean up sewage disposal systems.
4. The Water Quality Bureau should monitor the water near industrial sites to insure compliance with the Section 208 Water Quality Standards.
5. Communities must encourage municipalities, industry, agriculture and recreation users to coordinate water use planning.
6. All should practice water conservation to insure adequate supplies of water for future generations.

LOCAL EDUCATION APPLICATIONS

This grouping of recommendations, by far the largest, concerns itself with utilizing telecommunications to educate or inform the general public. This notion implies a system much like the community information office concept explained in detail in Section VIII of the final report; however, for the purposes of this attachment, suffice it to say that a telecommunications system would be the perfect medium to disseminate the following recommendations. The communication here is, essentially, one-way out from the system hub (Helena) to the CIO nodes located at various cities throughout the State, and would cover the topics included in the recommendations enumerated by the following list.

LOCAL EDUCATION APPLICATIONS

1. Ag producers must learn to conserve energy through better farming practices by using such methods as chemical fallow, minimum tillage, multiple hook-ups and more efficient use of equipment.

2. The Extension Service should develop educational programs for dispensining ag research station findings and for encouraging conservation by the general public.

3. Suppliers and producers of energy need to inform those in agriculture, in a more timely way, about the true availability of fuel suppliers.

4. A water development and conservation education program should be provided by the Montana State University Extension Service and Soil Conservation Service of the USDA to include the following: best practices regarding irrigation management; low energy irrigation systems; ditch consolidation where feasible; water re-use systems; encouragement of 90 percent ACP cost-sharing irrigation conservation practices; updates of current applicable water laws, and atmospheric water research.

5. Courses should be continued that are similar to the estate planning correspondence course of the Extension Service.

6. Greater participation in local planning functions should be encouraged; and an increased awareness on the part of the landowner as to existing land use problems should be developed.

7. The Extension Service should expand its involvement with problems affliated with small tracts of land intended by the owner for agricultural use.

8. People should become aware of the need for education in estate planning as provided by the Extension Service.

9. All agencies need to continue their outreach functions to producers to correlate conservation practices and economic returns.

10. A joint Soil Conservation Service, Extension Service, Bureau of Land Management, and Forest Service statewide program to educate land users on use of state soil survey data should be organized.

11. Information on cottonwood forestry should be developed and disseminated.

12. Information on wood energy alternatives and technology should be provided.

13. The public should be provided with more information on the use of wood stoves, resulting in a minimum of pollution.

14. It is felt the Extension Service could help by hiring an extension forester to gather and disseminate useful forestry information and research, as well as making the forestry issues known to the general public.

15. Better education should be provided to all age groups to increase their knowledge about the availability of public land, and about the proper etiquette on private land, including awareness of litter and trespass laws.

16. Through extension homemaker clubs and other consumer groups, encourage a change in attitude in many people to recycle as much usable household waste as possible.

17. We should encourage conversion of as much solid and municipal waste to energy and fertilizer as possible.

18. Offer programs on family life through mass media.

19. Strengthen moral values and fulfill spiritual needs by promoting family involvement in church activities.

20. Encourage families to discuss values for its own clarification.

21. Encourage families to set their own priorities and roles.

22. Time management should be worked out and taught within the family.

23. Provide instruction to parents in the skills and knowledge needed to enable them to feel comfortable teaching sexuality and moral values to their children.

24. Offer instruction to parents on how to develop and maintain behavior guidelines, example setting, and integrity.

25. Encourage having a specific family togetherness time regularly, as once a week.

26. Quality child care centers should be made available to families which need to make use of them.

27. Courses on parenting should be made available to all adults and young people through schools, churches, adult education courses and county health departments.

28. Encourage people to take a more active part in school policy-making by attending school board meetings and parent-teacher conferences.

29. Encourage citizens to take advantage of the educational opportunities available, and to take part in helping the school plan for new and broader opportunities for students.

30. Make educational television available to all areas.

31. Give more support to home study, such as correspondence courses for credit, and for credit through Extension Service programs and through units of higher education.

32. Work to establish a course in family living as a required study in grades K-12.

33. Promote a greater consideration in school districts of pre-school children, kindergartens, and adult education extension classes.

34. Provide money management and budgeting courses through adult education, Extension programs, and family life classes, as a means of reducing one of the major sources of family stress.

35. Premarital and postmarital instruction for couples should be provided to help them plan and cope with the adjustment problems of marriage.

36. Encourage marriage enrichment education for couples through mental health facilities and churches.

37. Promote the teaching of skills to improve the self-image of the individual and family through clergy, mental health associations, adult education and home economics courses, school counselors, and Extension Homemakers.

38. Encourage the use of the elderly to serve as resource people within the community, as in 4-H clubs, schools, churches, Scouts, Adopt-a-grandparent efforts, block parents, and Big Brothers and Sisters programs.

39. Mental health centers, the county health department, and other agencies should offer programs in positive, constructive stress management.

40. Utilize all available county Extension programs and resource people involved in quality of personal and family life.

41. Provide for services of a professional home economist in every county on a full time basis, or through contract services.

42. Facilities and instruction should be provided for updating vocational and leisure time skills, cultural arts and physical fitness.

43. Counseling and training should be offered to displaced homemakers and single parents to help them assume a new place in our society.

44. Better opportunities should be provided for the gifted and for those with learning disabilities.

45. Make use of senior citizens as continuing education teachers.

46. Encourage families to create a planned approach for developing energy-conserving habits and using energy-saving devices, such as acquiring more and warmer clothing, using wood stoves, recycling, car pools, and using public transportation.

47. Encourage the news media and educational TV channels to provide information and programs that encourage the uses of alternate forms of energy such as passive heat, active solar heat, gasohol, coal, wind, water, biomass, geothermal sources, and more underground construction for insulation.

48. Encourage the public to exert pressure on industry to save energy by reducing the usage of neon signs, throw-away products, open display refrigerators, and "planned" obsolescence.

49. Encourage consumers to pressure the manufacturers to develop energy-efficient products voluntarily and without a mandate from the government.

50. Encourage shelterbelt plantings around rural homes.

51. Information on how to cope with the shortage of energy is available, but methods are needed to assist people in acting on this information.

52. Encourage utility companies to make widely available interest-free loans for home improvements to conserve energy.

53. Provide more information and education to the public concerning the cost of producing goods and services, and the cost of packaging, all which add to increased use of energy.

54. Encourage communities to make efforts to provide public transportation and encourage the use of it by such plans as having mini-buses travel between communities, designating central points for car pools, and building bike paths.

55. Encourage communities to coordinate community activities in order to make it possible for people to adjust their personal activities to help reduce fuel consumption.

56. Encourage authorities to enforce the laws pertaining to the use of streams, lakes, other bodies of water, air, land use, and of all the natural resources in the state.

57. A consumer education mobile unit should be provided in counties or areas.

58. The governor should proclaim a statewide consumer education week.

59. Mass media education should be accomplished through 30 second, 60 second, or half hour presentations on radio and television, and through ads and articles in newspapers.

60. Educational study packets for clubs and individuals should be provided.

61. Consumer education programs on calbe television should be more widely used.

62. Educational programs are needed on coping with television commercials.

63. Consumer education camps or fairs for youth should be held.

64. County "consumerama" workshops, fairs, and displays should promote consumer education.

65. Financial counceling services should be established in each county.

66. All kinds of agencies should be encouraged to include consumer news in their newsletters and to display such items in their offices.

67. Cassettes on consumer topics should be made available for loan by agencies.

68. Point-of-purchase information on consumer products should be provided.

69. The Extension Service should provide more pamphlets on consumer topics.

70. The Extension Service should develop home study courses in consumerism.

71. An Extension Home Economist should be provided for every county.

72. Classes and information on retirement should be provided by businesses.

73. A home health care program should be established for all communities.

74. The media should do more to educate persons on available medical services.

75. More education for law enforcement officials should be provided regarding chemical substance abuse.

76. On-the-job safety classes should be instituted.

77. Health education study packets should be provided.

78. A free hotline for health-related questions should be established.

79. Greater attention should be given to everyday practical living difficulties of the handicapped.

80. The issue of violence in the family should be discussed in each county, including abuse of children, spouse, and the elderly. Reporting known or suspected abuses should be encouraged, as well as encouraging educational programs. Counseling or group therapy for abusers should be made available.

81. Communities should help people realize that there is a great opportunity for savings and for improving nutrition by using the co-op farmers' markets.

82. Accurate information should be provided to the public on nutritional values and food preparation through the radio, newspapers, billboards, with special attention given to those persons of elementary school age up through adulthood.

83. People using the government's supplemental food programs should be required to have counseling by nutrition professionals or to attend nutritional consumer education programs. This would teach buying skills and nutrition information.

84. Special emphasis should be given to nutritional education for the elderly and for women who are considered high risk pregnancy cases.

85. Elementary age students, mothers of preschool children, pregnant and lactating mothers should all be encouraged to take part in education for better nutrition.

86. Information and training should be made available to homemakers to help them with meal planning alternatives, many of which can lower cost, be acceptable, and still provide proper nutrition to the family.

87. Workshops and seminars should be conducted to inform interested persons in gardening, utilization of home grown food, hydroponic gardens, freezing, smoking, canning, drying and about all kinds of food preservation skills. Courses should also be conducted to provide information on the use of chemicals and additives in food including the excessive use of sugar, salt and vitamins. Such courses should be offered to all ages.

88. Efforts should be made to utlize knowledgeable local resource people to teach nutrition at clubs, meetings, school activities, and fairs.

89. Better opportunities should be provided for the handicapped in most communities.

90. An effort should be made to promote activities that will include youth, single people, newcomers, physically and socially handicapped persons.

91. Planning boards should be created to help plan for orderly housing development and in order to protect prime lands, provide for roads, road maintenance, snow removal, fire protection, as well as to help look ahead and plan for the influx of people.

92. Public understanding of law enforcement should be improved, and activities provided wherein the police will develop a friendly relationship with young children.

93. Attempts should be made to increase community pride through a cleanup campaign.

94. Communities should give more encouragement to people to become good neighbors. Special attention should be given to newcomers.

95. Recycling or collection centers should be established in every community and people encouraged to use them.

96. Markets for local commodities should be set up and people could be encouraged to buy locally.

97. Greater effort should be made to convince people of the wisdom of supporting local businesses whenever possible.

98. During non-school portions of the year, the school facilties should be made more widely available.

99. Institutional buildings should be shared with the community.

100. Most communities have need for and could provide for more facilities such as parks, swimming pools, ball parks and playgrounds.

101. Youth and elderly could be involved in the life of the community by thoughtful matching of needs and skills.

102. In order to develop community and national pride, we should strive to support programs that place emphasis on patriotism, heritage of community and state, and a feeling of ownership.

103. Communities should promote education through classes and discussions on the workings and functions of local, state, and federal governments.

104. Citizens should take opportunity to become effective in the legislative process. We should be willing to contribute time and effort in public programs such as open forums organized to examine and evaluate public policies in agencies, including the cost-benefit ratio of such policies and preparing for changes in local population.

105. Parents should be given the opportunity to take advantage of a continuing education program which relates to the eventual training of their children with respect to alcohol, drugs, and sexual abuse.

106. A continuing effort should be made by youth and parents to maintain open lines of communication within family unit. This can be accomplished through a coordinated effort at family, school and community level by encouraging parent-youth participation at all levels of interest.

107. A program should be developed and implemented to increase the participation of the presently uninvolved student. This should include peer counseling programs in junior and senior high schools under the supervision of school counselors in order to reach many shy and uninvolved students.

108. Encourage youth to take part in the responsibility of policing themselves and in participating in youth counseling programs.

109. There needs to be classes or other educational forums for adults and youth concerning the emotional aspects, effect and related problems of alcohol and drug abuse. Develop an awareness of existing programs.

110. Based on complete and factual information, people should develop better verbal communication between parents and youth about feelings on use and abuse of drugs and alcohol.

111. We should make private counseling available, especially in rural areas.

112. We recommend the establishment of a Community Education Program, either on a county or community basis, in order to utlize resources of an entire community. Such a community education program stresses development and the strengthening of the relationship, mutual dependence, and basic linkage between home, school and community in all phases of human growth.

113. We would like to see more programs encouraging senior citizens involvement with youth.

114. We recommend an attempt to involve all media in a massive awareness compaign about problems and the needs for community development. Also, they should be asked to aid in recognition of volunteer and youth achievement.

115. Concerned citizens groups should be created to solve community problems. All age groups should be represented. Training should be offered to volunteers.

116. We should provide leadership training for all volunteer groups.

117. More family-oriented recreational opportunities should be developed. Encourage a "one night a week for families."

118. Make youth aware and encourage them to participate in unstructured recreation such as hikes, swimming, etc.

119. Positive media influence such as the ads on families and childred should be directed by some churches.

120. We should encourage the development and use of moral TV programs, movies, music and books.

121. Churches should be asked to promote and support youth groups within the church as well as outside of it. Eamples are Young Life, Goods News Clubs, 4-H, Boy Scouts, Girl Scouts, Campfire.

122. Churches should provide workshops for parents to aid the church and family in teaching morality.

123. Law enforcement personnel should develop an extensive public relations program resulting in better communication between youth, adults and law enforcement officials.

124. A public awareness program to appraise people of help available should be established.

125. TV commercials promoting good family relations should be continued and encouraged.

126. The Big Brother-Big Sister Program should be encouraged.

127. Communities should develop a counseling program involving youth assistants who have been trained to spot problems.

128. Juvenile authorities should encourage youth to take part in the responsiblity of policing themselves.

130. Adults should give more guidance to youth in selecting mass media.

131. Better use of leisure time should be encouraged to counteract unrealistic expectations that are being developed through poor mass media content.

132. Better use should be made of the Public Broadcasting Service and mass media to increase awareness about parenting skills, family relationships and communications.

133. Encourage programs of energy conservation at all levels in private industry and business.

134. Communities should encourage orderly growth by promoting small businesses and industry that would provide local jobs and would not disrupt lifestyles.

135. Encourage the consolidation of services of local governments, where feasible and acceptable.

136. Communities should encourage leadership training at local levels of the KEEP-type programs in order to develop confidence and skill.

137. There should be some form of management training available to local business persons. The occasional opportunities now available are not always advertised or adequately promoted.

138. Encourage all persons to support consumer health education programs in cooperation with established health agencies.

139. State and federal agencies (including Department of Natural Resources and Conservation and the Cooperative Extension Service) should continue their educational efforts to inform all water users about filing water claims under S.B. 76.

EDUCATIONAL SYSTEM APPLICATIONS

Here telecommunication systems designed much like those discussed in Attachment Two would carry various data from a centralized hub, such as Helena, but the termination points for this data would be more properly located in various schools throughout the State, although there is little reason that school personnel could not schedule time for use at their local community information office. The topics carried in this essentially one-way communication are included in the following recommendations:

EDUCATIONAL APPLICATIONS

1. Encourage teachers to provide information about career and job opportunities in each of their classes.

2. Encourage high school classes for teaching employable skills to youth and adults, as well as having vocational training at the colleges and Vo-tech centers.

3. Encourage family life courses in school for pre-adolescents through high school.

4. Emphasis should continue to be placed on the education of our youth in conservation practices.

5. Encourage children to learn the principles of work, through working within the family, and by examples set in the family.

6. Family life and communications courses should be made mandatory in schools for grades K-12.

7. Begin drug and alcohol information and education in primary grades and continue throughout the school years.

8. Schools should develop more vocational-technical and apprenticeship workshop programs for on-the-job training. These should be available in all schools, and with the support and cooperation of local businesses and agencies.

9. Continuing education opportunities should be provided for all age levels. Local school districts should take advantage of the one-mill levy option to fund these programs.

10. Schools or agencies should conduct educational programs designed to help decision makers and other citizens understand federal and state regulations concerning solid wastes, sanitation, water quality and other public municipal concerns.

11. Public responsibility should be taught and practiced, starting in the first grade in all public schools.

12. Emergency medical training on a continued basis should be included in junior high and high school curriculum to better protect people in isolated rural homes and dwellings.

13. Education classes should be established in emergency medical training, first aid, CPR, substance abuse, and prenatal care.

14. First aid and CPR classes should be made mandatory in high schools.

15. Teachers should be required to take courses on substance abuse, identification of drugs, and how to handle students on drugs.

16. Sex education should be provided at an early level for both boys and girls. Counseling is more effective at a later date.

17. A courtship and marriage course at high school level should be taught.

18. More ministerial family counseling services should be established.

19. Youth should be given solid facts about cults and cliques and should be discouraged from becoming involved with these.

20. There should be better alcohol and drug education programs provided for all students, dealing with the realities of the drug and alcohol situation, not just factual textbook material.

21. Youth must be informed about the recreational facilities now in existance, and must be included on planning boards where decisions are made that affect them. Allow them to demonstrate their good judgement.

22. School curriculum should be expanded to include effective career training and counseling courses.

23. Schools should place more emphasis on the basics: reading, writing and arithmetic.

24. Schools should provide additional and supplemental classes for the gifted.

25. School systems should sponsor adult education classes on consumer topics.

26. Mandatory consumer education classes should be instituted in grades K-12.

27. Medical students and prospective teachers should be required to take nutrition classes as part of their curriculum.

28. Both parenting and sex education classes should be required and taught at the junior high school level. Sex education should be required and taught at the lower grade levels.

29. Teacher training institutions should do a better job of training secondary teachers to understand and deal with emotional problems of the adolesecent.

30. Nutrition education should be made a required study in grades K-12.

31. Citizens should be encouraged to respond to the food assistance programs such as WIC, EFNEP, food stamps, hot lunch programs, etc. School lunch personnel should avail themselves of nutritional training whenever possible.

32. A cooperative effort should be made between families and schools to train youth better before they enter into home and family responsibilities. This can be accomplished through expanding the school curriculum to include family life courses and adult/youth counseling.

33. Youth must be introduced at an early age to the process of decision making, communications, role of parents, money management, and nutritional habits. This can be done both in the home and in the schools.

34. A strong education program in reference to life survival skills should be taught in the schools. Teacher training institutions should offer courses in management.

35. Youth need to be made more aware of the opportunities available around them.

36. Financial management and money matters should be taught more extensively in our schools.

APPLICATIONS REQUIRING INPUT FROM THE PUBLIC

The concept of systems design required to meet public needs for the below recommendations includes a capability for two-way communications. Again, detail for this notion is included in Section VIII of the final report, but generally, systems carrying this traffic require input devices at the local level, versus the essentially one-way (receive only) mode of attachements two and three. In many cases, such as the grass roots application for writing water development programs, telecommunications applications are obvious. Community leaders could hold public meetings at the community information offices to ascertain public sentiment on issues such as these and transmit their findings to Helena following the meeting. Other issues include the following:

INPUT FROM PUBLIC

1. County or District land use plans should be developed through community action group techniques.

2. Owners of water rights should be urged to register them.

3. A water improvement and development program for Montanans should be written by the effort of people at the grass roots in cooperation with state and federal agencies.

4. Every effort should be made to get the federal and state government to include farm families in the regulatory and program development process.

5. The State should develop a system for prioritizing public services for the State of Montana, considering population density, availability of funds, geographical differences and needs.

6. Public Service television and the local newspapers should be encouraged to identify local issues.

7. Community action groups should be formed from the membership in all local service groups to identify and prioritize local problems and to invite local problem solving activity.

8. Involve youth in a meaningful way in planning, development, management and funding of recreational facilities and programs.

9. Parent involvement in school programs on substance abuse should be promoted.

10. Helicopter ambulance service should be available to all communities.

11. Local land owners and the Fish and Game Commission should work together to establish workable game policies for each area.

12. A cooperative effort by the various farm organizations in support of a unified effort to tell agriculture's story should be organized.

13. Research and education are needed for the effective disposal of hazardous wastes and the efficient use of mine waste materials. There must be better communication between industry and the public to promote more understanding of goals and the needs of the industry.

14. Encourage all elections to be held at the same time to eliminate the multi-costs from operation wherever possible.

15. Encourage the establishment and continuation of active Planning Boards made up of concerned citizens who are willing to work closely with elected officials. Counties which have not already developed long range comprehensive plans should be encouraged to do so, since these plans help identify goals and guidelines for future growth and help communities qualify for impact related assistance.

16. The Montana Highway Commission should consult with county commissioners on local problems.

17. Concerned citizens should encourage the legislature to support educational TV for all Montana.

18. Recruitment of medical personnel should be a community priority.

19. Media should be encouraged to put more emphasis on the positive activities the youth do rather than on the negative.

20. Professional help should be provided on a 24-hour basis and a crisis line be established.

21. More public input should be utilized in law enforcement procedures.

22. There should be more opportunity for personal counseling of students.

23. A concerted community effort should be made to expand the availability of educational television, resulting in better quality programming.

24. Communities, counties, or areas should establish a toll-free hotline for consumer complaints.

25. A consumer advocate should be established in state government.

26. Inform the school board of the community desire to return to the teaching of basics.

27. Communities should develop comprehensive plans for safe disposal procedures for chemical, atomic and solid waste. No sites should be opened until all safety criteria are met.

28. Encourage family leaders to select television programs, letting the family itself do the selection.

STATE DATA-BASE APPLICATIONS

The difference in this grouping of recommendations is merely a matter of degree. Whereas the Attachment Three issues would require occasional input from the public, the issues in this attachment would result in moderate-to-heavy input from the public. Therefore, the systems design (covered in detail in Section VIII of the final report) would also require input/output terminals at the local level in order to draw upon information of such common and wide-spread interest as to demand a centralized data-base depository, probably located in Helena. The recommendations requiring such a system along with pertinent comments are as follows:

STATE DATA-BASE APPLICATIONS

1. Closely monitor foreign ownership of agricultural land and the effect on the traditional family farm.

   Land ownership facts can be relayed to a State data-base in Helena; the populace can then obtain this information through the community information office, nodes described in Section VIII.

2. Consumer Information Centers, such as the one at Pueblo, Colorado, should be promoted.

   This data base can be constructed and made accessible to the people, through CIO use, using CRT's or FAX devices.

3. A complete inventory of water resources should be undertaken. Wasteful water practices must be eliminated. Off-stream storage reservoirs to maintain instream flows should be investigated and promoted. A resource library which contains information about agencies involved in controlling wildlife and recreation activities should be developed.

   The inventory of water resources, as well as the resource library, can be made into interactively-accessible data bases for the use of Montana's population.

4. Extension Service should join in the leadership to accelerate the completion of statewide soil survey.

   Once this survey is complete, and it, too, could be done on a batch I/O basis by field extension agents, the survey data could be converted into a data-base which all CIO's could use.

5. Water rights and adjudication should be maintained by the state judicial system.

   This lengthy data-base would be of particular interest to legal personnel throughout the State.

6. Equipment duplicated in medical centers should be consolidated.

   An obvious use of telecommunication systems to transmit, store, and provide this information to interested parties.

7. Coordination between helping agencies should be improved.

   Telecommunication systems can play an important role in this coordination process. In order to coordinate, one must first communicate.

8. Research should be promoted in infant mortality and prenatal deaths.

   This research, done by local physicians at the request of the State, can be compiled, transmitted, stored, and made available to the populace and other researchers utilizing telecommunications systems.

9. A statewide network for referral services and medical information should be established.

This network, a C.I.O. application, could provide valuable information to the people of the state upon demand if the proper interactive network were established.

10. A list of all community and governmental agency resources should be compiled and made public.

I/O terminals, linked to a central processor could generate this data base. The public could then access the data base through C.I.O. means.

11. Agencies should establish communication systems of interagency referral, community resource board, and directories of all agencies.

I/O terminals could also input this information to a data-base storage device, which could disseminate it on command to the public.

12. Complete extensive studies should be made as to why students use alcohol and drugs.

Researchers could input this data on a batch basis to a CPU, which could then provide the information to interested parties pursuant to requests from the CIO to do so.

13. A list of available leadership resources in various areas, together with a list of leadership needs should be developed, and made available.

An obvious CIO/telecommunications application. Scattered areas consolidate and transmit data, which is then centralized and made available to demand users.

14. Assess what is available, determine what the community needs and wants and encourage full use of existing facilities, including public buildings.

This inventory can be done by local civil defense (or other) personnel. The information can then be taken to the CIO node for transmittal to Helena, which would store it pending user demand.

15. State agencies should promote state-wide and regional emergency services networks which provide a universal emergency phone number such as 911. Local ambulance programs and improved transfer services should also be encouraged. Training programs for the general public, in addition to that of Emergency Medical Technicians, such as standard and advanced first aid, first responder skills and cardio-pulmonary resuscitation, should be established.

The CIO nodes, using emergency response numbers on a dial-up basis, could form the backbone for the emergency services networks mentioned. The CIO's could also provide viewing areas for training classes transmitted from Helena.

16. A uniform state system of rural addresses should be established.

Once this system is established, post offices, as well as other users, through requests to the CIO's could access the information for their own purposes.

17. All roads should be named and marked. All addresses should be included in local phone directories along with a map of the area.

CIO's could assist in this process by serving as bases from which the extensive road survey could be performed by county personnel and from which this information could be transmitted, via FAX or other terminals to Helena for consolidation.

18. Communities must encourage municipalities, industry, agriculture and recreation users to coordinate water use planning.

Desires for water use can be gathered at the local level, transmitted to Helena from the various CIO's and consolidated there. The data can then be used to develop a workable state plan.

19. We should develop a coordinated system to provide reliable technical information on alternative energy sources such as solar, thermal wind, MHD, low head hydro-power, etc.

The CIO's can serve well as the transmission network for the coordinated system mentioned above, both for information going to a centralized data base and for information going to the public.

20. An index of all local, state, and federal regulations that apply to the use and development of energy should be prepared for people who plan to develop some kind of energy source.

This lengthy and complex index could be located in Helena as a data-base and available to the public upon demand through the CIO's.

21. The Extension Service and Soil Conservation Districts should consolidate natural resource data for use in development of land use educational programs.

This information can be gathered locally, brought to the CIO, transmitted to Helena for compilation, and made available to the public, through interactive demand.

22. The Montana Extension Service should analyse the alternatives and provide information to agricultural producers on the following: examples of on-farm incentives to encourage long term employment, such as with crop, livestock or land percentages; incentives to farmers and ranchers who are willing to provide on-farm training of employees to be subsidized by the Job Service or a similar agency.

These alternatives can be centralized in Helena and, using the CIO concept, accessed by the public.

23. Market research by the Extension Service for alternate crops should be developed and the Wheat Research and Marketing Committee should work to expand foreign markets and develop Montana's participation in these markets.

This market research, like other state data-bases, can be made into an accessible data-base at a centralized location and provide information to the public on a damand basis, through the CIO's.

24. Predator and rodent control should be administered at the state and local level by the Montana Department of Agriculture.

County extension agents (or other personnel) responsible for this function can forward their findings to the CIO's, who can then send their information to Helena for data-base consolidation. This data can then be made available to the general public or other interested users on a demand interactive basis.

MISCELLANEOUS APPLICATIONS

The few applications listed in this section fall into three categories: Teleconferencing, telemedicine, and telemmetry (monitoring). Teleconference is a well-known telecommunications application wherein several users who need to communicate with each other over great distances do so utilizing telecommunication techniques to avoid expensive and time consuming travel.

Telemedicine, a fairly new telecommunications application, is a technique whereby symptoms are transmitted to a distant physician and locally trained personnel at the transmittal site perform non-clerical surgical and diagnostic procedures, pursuant to the distant physicians guidance. Obviously, video capabilities are extremely useful in a system of this type.

Telemmetry is an established telecommunications application wherein remote sensing devices transmitting over great distances perform the work of on-site inspectors, thus precluding the need for FTE slots for inspectors, and their associated travel costs.

MISCELLANEOUS APPLICATIONS

1. Montana's Congressional delegation and representatives of the state legislature should meet together to act on energy policies for the state.

   Teleconferencing could accomplish this without the cost, inconvenience, or loss of time involved with travel.

2. Many areas need a mobile health unit.

   This need, along with number three below, can be satisfied through the use of telemedicine.

3. Efforts should be made to see that every community has the services of a school nurse or a public health nurse.

   Telemedicine is an obvious solution to this problem, insofar as telecommunications can make one centralized physician available to many locations.

4. The Water Quality Bureau should monitor the water near industrial sites to insure compliance with the Section 208 Water Quality Standards.

   A monitoring network, utlizing telemmetry can be utilized to accomplish this.

5. Clean air standards should be enforced, with conflicts resolved. Independent non-partisan monitoring should be attached to all major plants.

   Telemmetry monitoring can satisfy this need.

6. Water quality in rural areas should be checked frequently.

   The obvious solution to this is to construct a telemmetry monitoring network, which can perform this labor without the cost of travel or inspector position FTE's, and which would not be restricted by weather conditions from functioning.

SECTION VIII.

A PROPOSAL

FOR AN AUDIO AND DATA

TELECOMMUNICATIONS NETWORK

IN MONTANA

by CHARLES BICKENHEUSER

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EXECUTIVE SUMMARY

This report is written for the manager who does not have a technical background. This is seen by the author as the only practical method for the dissemination of information that, at its core, is highly technical in nature but, because of its technology, has great need to be understood first in everyday "people" terms before full and proper use of any technical system can be realized. This approach will also keep the focus on systems deployment, use and benefit.

This proposal sets forth an audio and data telecommunication network called the Montana Information Network deploying sixteen "as needed", or part-time, Teleconference Centers with audio and facsimile entry points and eleven Community Information Offices providing audio, facsimile and data entry points on a full time basis. 98 percent of Montana residents are within a two hour drive (at maximum) of a Community Information Office and 90 percent of the population is within a one hour drive (again at maximum) of a Teleconference Center. 45 percent of the population is within a fifteen to twenty minute drive of any audio telecommunication entry point.

The Montana Information Network was designed to meet the needs of three seperate groups of users in four configurations. The users are 1) the general public, 2) the legislative branch and 3) the executive branch. User configurations are 1) teleconferencing for state agencies, 2) data base and audio teleconferencing entry points for the general public, 3) legislative interaction with the

public and 4) executive interaction with the public. Data base entry points located in the Community Information Offices will offer more than 500 million reference citations in several areas of interest: Agriculture, business, veterinary and general medicine, economics, legislation (state and federal), energy, environment, forestry, ranching, the social sciences and electronics.

First year systems costs is estimated at $1,378,000. ($370,000. is for one time purchase of equipment) saving the state $3,413,000 in travel costs and $787,000. in salary costs by reducing in-state travel of government employees 30 percent. This does not take into account increased productivity by both private and public sectors.

The real benefit of any telecommunication for audio and data interfacing comes not just from monetary savings but from an increase in information retrieval and an increase in dialogue.

CONTENTS

INTRODUCTION

In the main this project is concerned with the "how to" of audio and data telecommunications; in reality this is only part of the story. The development of computer and telecommunication links during the last decade has been referred to as the "second industrial revolution". The analogy, in general, runs something like this: during the first industrial revolution man made machines to do much of the work previously done by hand - today, in the second industrial revolution, man is building machines (computers) to assist intellectual processes. To be sure there are "thinking computers" that emulate creative mind functions, but only a few shared between a handful of universities. What this project is concerned with, and what business and most scientific communities use, are data computers; computers that store and manipulate information numbered in the billions upon billions of separate, individually identifiable units. Computers do what humans cannot do well, namely, handle large amounts of information with both speed and economy. Today computers can send and copy the Old and New Testaments in one thousandth of a second plus a transmission time of six billionths of a

second over satellite transmission links from New York to San Francisco.

Computers can search a data base (a collection of information) for specific words not listed in conventional indices. A search can be conditional in regards to date, period, and configuration with other criteria such as author, other words and page, paragraph or sentence association. A librarian, working with several volumes, can pull and record perhaps a hundred reference citations in one hour. A data terminal can pull, and have recorded, a thousand or more specific citations in just two or three minutes. And the more experienced one becomes with computer data base searches the more specific, and useful, are the products of a single search. The librarian, in the hour search may have used ten to twenty volumes; the computer search may have scanned ten to twenty thousand volumes.

Because of cost reductions in computer and telecommunication hardware it is now possible to effect real savings in both travel time and travel cost for private and government sectors. Typically systems should pay for their installation within a year and save 30 percent in real time and travel costs begin-

ning in the second year following systems development. For Montana state government this could mean a savings of three million in travel dollars alone and another savings of 50 man years for state employees. And this is only the first piece of the pie.

To be specific, the audio and data telecommunication system that this proposal has developed would establish eleven full time Community Information Offices (CIO's) and sixteen additional Teleconference Centers (TC's) for audio teleconferences on an "as needed" basis. The CIO's will have full time audio, facsimile and date capabilities. The TC's will have audio and facsimile capabilities only and use available public facilities such as libraries and schools. This system could be named the Montana Information Network and would be used by local and state government agencies, private citizens and non-profit groups. Out of state individuals and groups would also have network access. The MIN would be funded by the state. Basic design goals are fourfold: 1) a teleconferencing network for state agencies, conducting routine business, 2) a distributed data base entry point for private citizens and government employees in Montana to search for and identify information

related to agriculture, economics, industry, government, energy, education and family services, 3) an economic and easily accessible means for Montana residents to communicate with, and be informed about, their state legislature and 4) a network for the executive branch to expand contact with the people it serves.

Some specific needs that can make full use of teleconferencing are legislative hearings, special interest groups working on, or identifying, specific problems (as in the area of agriculture, veterinary medicine or energy conservation), legislative and executive work/study sessions and public hearings, emergency disaster networks, planning commissions, non-profit groups and legislative and executive news conferences.

Data entry from any of the eleven CIO's can access in excess of 500 million specific citations. Most data base searches take only a few minutes and provide the user with hard copy reference sources or selected text printouts. The ability to search for information quickly and thoroughly is extremely important: today's existing data bases will double in citation content during the next two to three

years. This means that by the year 1984 public data bases searches will browse one billion specific reference citations, most likely at speeds ten to a thousand times faster than at today's speeds.

The existance of audio and data points distributed throughout Montana will begin to parallel the grass roots, town-meeting concepts of democracy lost to urbanization during the last fifty to one hundred years. Much of the time and expense now lost to physical demands of travel can be decreased by the deployment and effective use of telecommunications. Problems identified, researched and perhaps solved in other areas of the world can be learned of quickly and utilized by local residents. The lag time from field research to print and hard copy distribution can be reduced from months and years to weeks, days and minutes. Quick, effect, accurate and thorough searches for information and communication of information gained unlock the future of Montana residents. The means to find, distribute and use the vast amounts of information being generated in the world today are at hand; the will to learn about these means and use them is the central question facing Montanans today. The answer to such a question points the direction Montana will take in the future.

NEEDS AND USAGE IDENTIFICATION

This first requirement phase is directed towards the people who will use any system of audio and/or data telecommunications and what they will ask such a system to do for them. In reality this phase could write itself with only a little prompting: reflect for a moment on all of the times that you have traveled to a meeting or wish you could have gone to a meeting or had people come to you for a meeting but couldn't because of lack of time or money or both. Also reflect for a moment about your needs for information and ask yourself if published reports, daily newspapers and weekly and monthly magazines supply you with enough information. If you work in a technical field does the library have all of the journals you need? If your area is applied technology, such as farming, do you have all of the information you may need, for example, concerning weed control or grain hybirds on a worldwide basis, as weed control and grain hybirds are researched on a world-wide basis.

It is an obvious fact that audio teleconferencing saves time and money and allows for increased dia-

logue. Depending upon the tasks of any given business or agency audio teleconferencing can save seventy to ninety percent of all travel, generally beginning in the second or third year of system deployment. The methodology of audio teleconferencing will be covered in detail in the requirement phase to follow, especially Technical Considerations. But for now the question as to who will use such an audio teleconference system can be answered simply: almost everyone. At first, beginning in the early evolution of use following systems deployment, audio teleconferencing systems merely replace time and travel requirements for conferences. The next evolutionary phase in usage, almost coinciding with the first, is an increase in overall teleconferencing. Groups that have, traditionally, not been able to travel to meetings can be included more often in discussions that directly effect their lives: the handicapped, the poor, senior citizens and the young now have a means to directly communicate their thoughts to business, state and federal agencies, non-profit groups and to each other.

This decentralized process, as mentioned in the in-

troduction, makes possible a more frequent and direct participation in government by Montana residents. In many applications information can be collected, or dissimanted, in a more thorough, faster and direct manner by teleconferencing than by traditional means. This, however, means the decision making process will become increasingly distributed, which, brings us to an interesting point: telecommunications can decentralize communication but only management can make it distributed. In many applications management will want to share responsibility in the decision making process (this seems especially true for government). How well established management practices adapt to telecommunication systems deployment is a topic in itself and is covered in detail in the requirement phase entitled Management Considerations. However, two important facts concerning telecommunication systems deployment should be noted early on 1) the installation and implementation of telecommunication systems places great demands upon systems managers to answer increased agency and public demands for use and 2) the introduction of the general public to telecommunications must be patient and thorough. The use and understanding of telecommunication systems can truly be thought of as an evolutionary process spanning three to five years to

systems maturity, both for the general public and systems managers.

The Montana Information Network was designed to meet the needs of three separate groups of users in four configurations. The users are 1) the general public, 2) the legislative branch and 3) the executive branch. The user configurations are 1) teleconferencing for state agencies, 2) data base and audio teleconferencing entry points for the general public, 3) legislative interaction with the general public and 4) executive interaction with the general public.

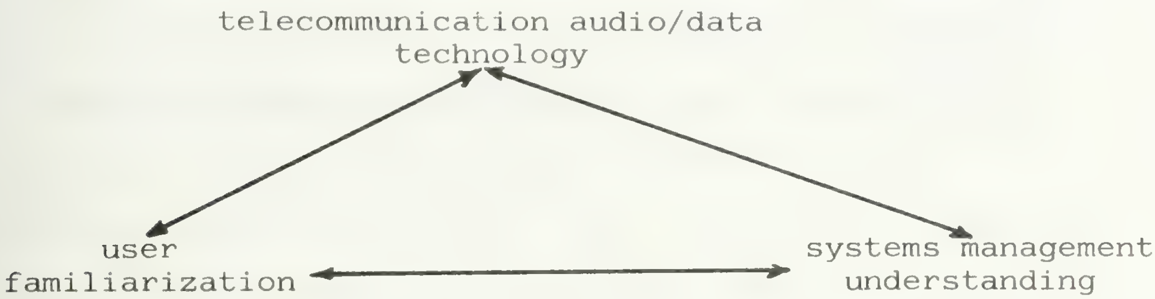
Several authors have recognized the advantages to decentralization: local control, closeness to user needs, greater user accessibility and an opportunity for the user (private sector as well as public) to become more intimately familiar with and capable in the use of telecommunications (King,1980). Management distribution follows such systems familiarization. The overall assumption is that traditional productivity will be enhanced. Some systems already automated and matured report administrative cost reductions at one thousand to one (Coleman and Riley, 1977). The challenge facing the deployment and use

of telecommunication systems in Montana is to extend to the general public the same corprate benefits realized by government and business. Benefits that include not only time and costs reduction in present day, traditional transactions but benefits that allow people to increase their productivity and enhance their knowledge in areas of interests.

The sixteen Teleconference Centers (the "as needed" audio sites) and the eleven, full time Community Information Offices, with audio and data entry points, will allow any user the opportunity to receive or transmit information concerning, to name a few, farming, ranching, energy, tourism, community and regional/state planning, the environment, government (local, state, intra-state, federal) any of the non-profit and public action groups and education. In essence, what ever needs there that must be communicated between people can be communicated over teleconference networks with increased efficiency over conventional means of communication (travel time and expense, loss of personnel time, point to point telephone conversations, bulk mailings). In this configuration needs determine usage: the more familiar systems managers and the general public

become with telecommunications deployment the greater the usage of deployed systems becomes.

Telecommunication systems deployment success depends upon three central elements:



This round-robin operational mode is weighted only by user needs. User familiarization and training is covered in the requirement phase entitled Training and Familiarization but it is well to note that if the user is introduced to audio and data entry points with some sincerity and patience on the part of management staff the user quickly adapts to the teleconference procedure.

SITE SELECTION

Site selection was measured by two considerations; 1) population distribution and 2) geographical considerations. The goal is to have Teleconference Centers (the "as needed" audio conference sites) and the Community Information Offices (full time data/ audio centers) placed throughout the state to allow the greatest number of people access to data and audio entry points: The Community Information Offices (CIO's) are placed in the larger cities, the Teleconference Centers (TC's) in the mid-size rural towns. Four of the CIO's are in cities that have populations of 30,000 to nearly 70,000: the remaining seven CIO's are in cities whose populations are generally numbered between 10,000 to 24,000 people with one exception. All sixteen of the TC's are in towns that have populations between 2,000 to 7,000 people, except one, with the main populations between 3,000 to 4,000 people. As will soon be evident 45 percent of Montana residents are within a fifteen minute drive of any audio entry point (TC's and CIO's), and 36 percent of the states residents are within a similiar fifteen minute drive for both data and audio entry points (the CIO's).

The population figures are from the 1980 census. The city and town populations, as well as the total state population, has been reported, but not the county populations. Therefore, the city population figures are inclusive of city limits only. It is, however, a reasonable and safe assumption to say that more people live closer to a city limit than otherwise, such being the nature of urban development.

The eleven CIO sites are:

Billings	66,800	
Great Falls	56,700	
Butte	37,200	
Missoula	33,400	
Helena	23,900	
Bozeman	21,600	
Havre	10,900	
Kalispell	10,700	
Miles City	9,600	
Lewistown	7,100	
Wolf Point	3,100	
	281,000	(36% of total state population)

The sixteen TC sites are:

Anaconda	12,500
Livingston	7,000
Glendive	6,000
Sidney	5,700
Laurel	5,500

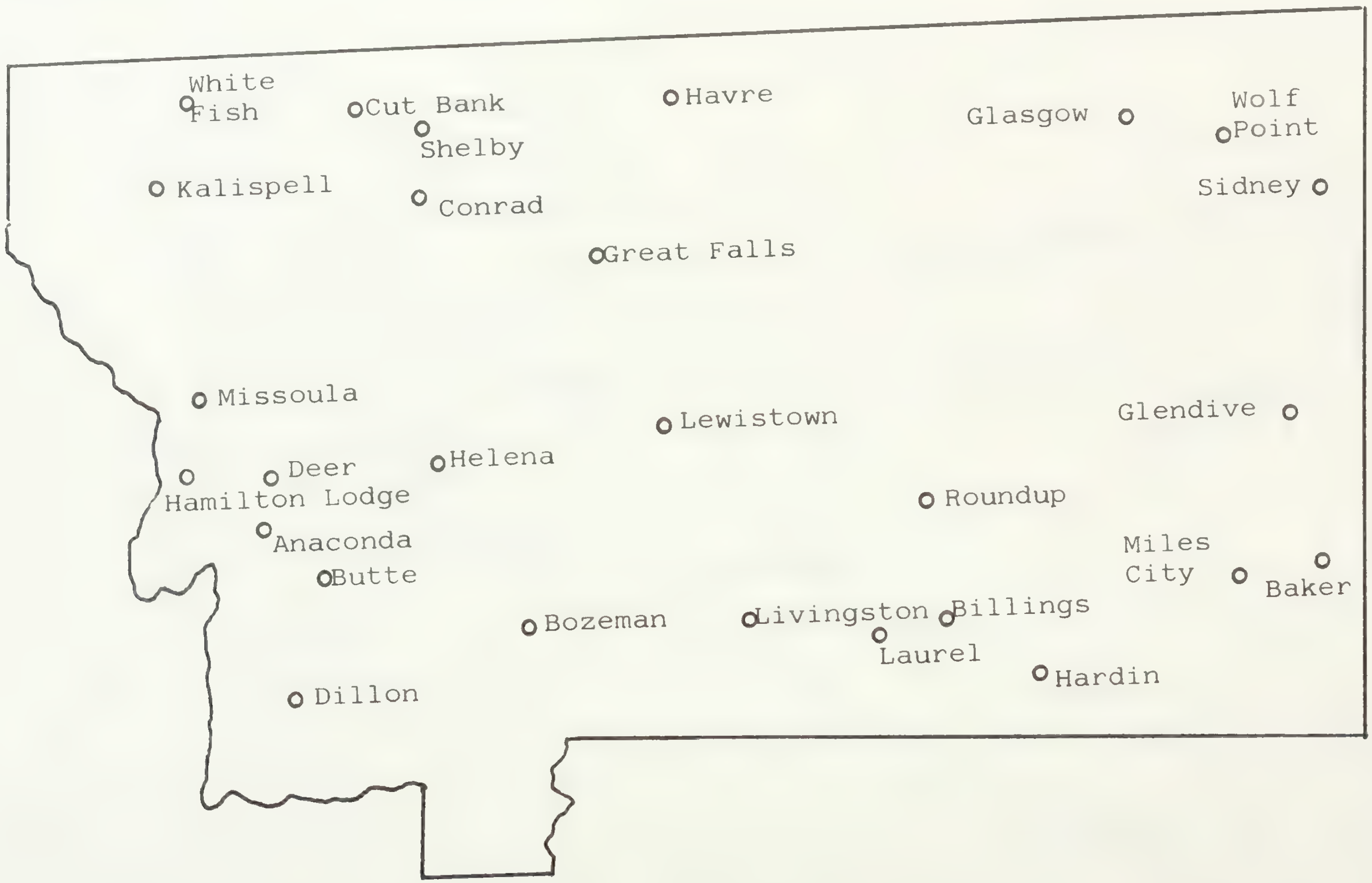
Glasgow	4,500
Deer Lodge	4,000
Dillon	3,900
Cutbank	3,700
Whitefish	3,700
Hardin	3,300
Shelby	3,100
Conrad	3,000
Hamilton	2,700
Baker	2,400
Roundup	2,100
	73,100 (9% of total state population)

The population distribution breaks down as follows:

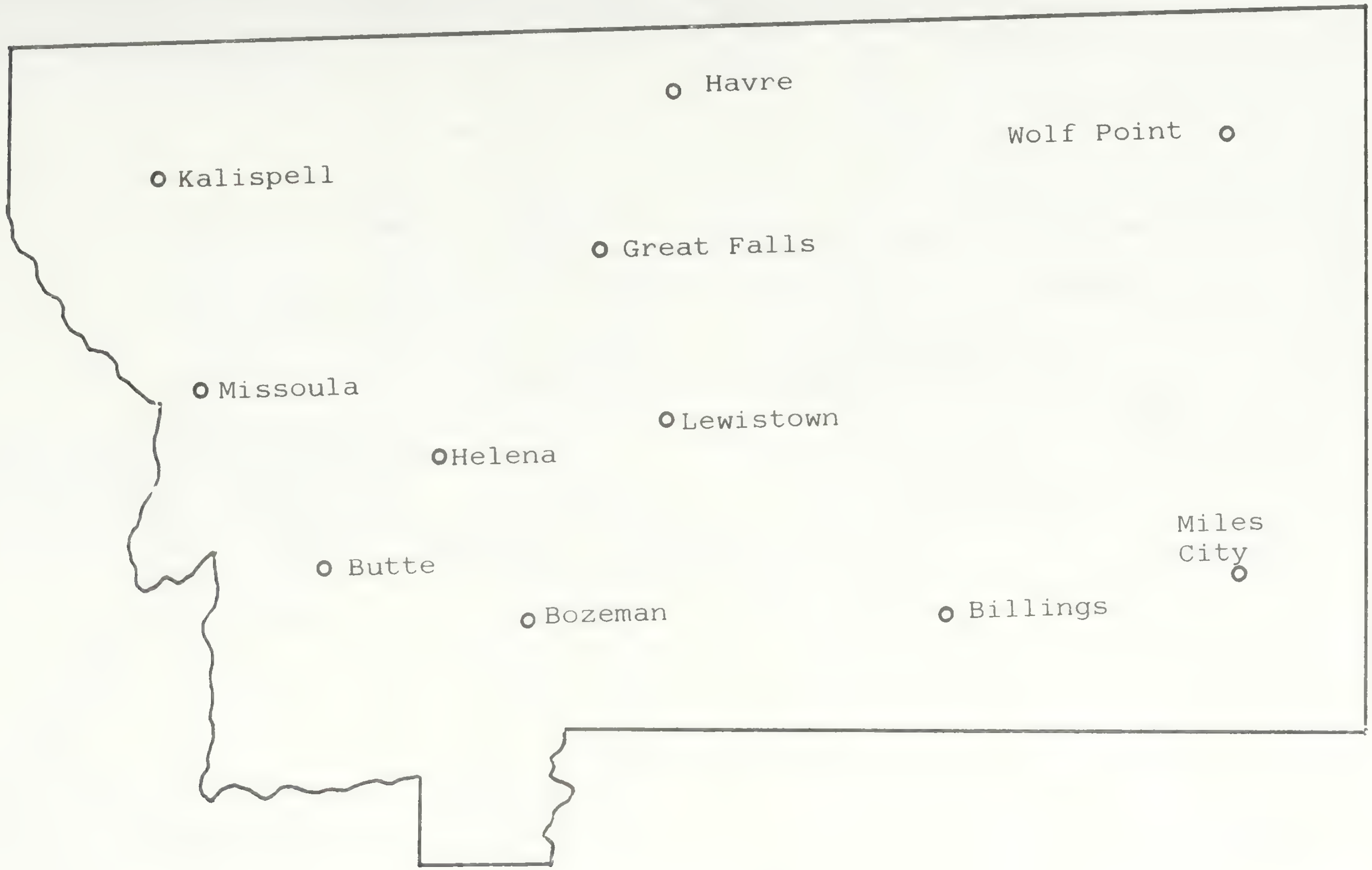
Community Information Offices	36%
Teleconference Centers	9%
	45% of total state population

As the population figures for the data and audio entry points are for people living inside the city limits it is likely that 60 to 80 percent of the states total population could be within a thirty minute drive (at a maximum) of an audio entry site (CIO's and TC's). Perhaps as much as 60 to 70 percent of the states total population could also be within a thirty minute drive (again at a maximum) of audio and data entry points

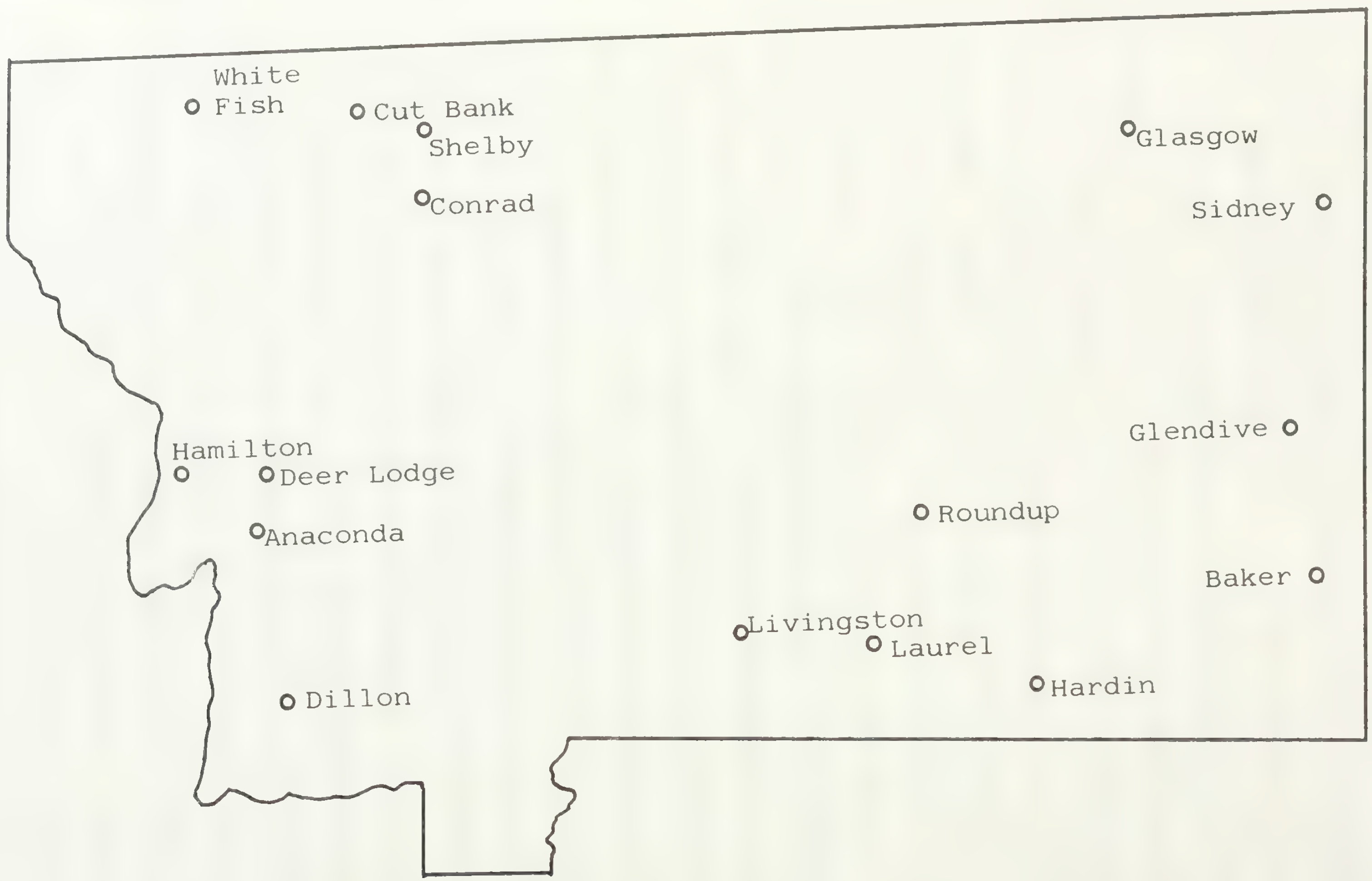
AUDIO ENTRY POINTS (Both Community Information Offices and Teleconference Centers)



COMMUNITY INFORMATION OFFICES (Audio and Data Entry Points)



TELECONFERENCE CENTERS (Audio Entry Points Only On An "As Needed Basis")



(the CIO's). This is only an estimate as the county population figures for the 1980 census have not been reported at the time of this writing.

The geographical breakdown is a follows: six of the eleven (or 55%) of the Community Information Offices are in the eastern two-thirds of Montana. Eleven of the sixteen (or 69%) Teleconference Centers are also in the eastern part of the state. Both CIO's and TC's need a population base to support teleconferencing and data entry operations. For this reason the full time Community Information Offices were placed in the larger cities with the exception of Miles City, Lewistown and Wolf Point. These three cities, especially Wolf Point, balance out geographical distribution requirements. In this regards a design goal was to place 98 percent of the state within a one hundred mile radius, or less (or two hours driving time maximum), of at least one Community Information Office. It was also a design goal to place 75 percent of the land mass of Montana within a fifty mile radius, or less (or one hours drive maximum), of an audio teleconference site (either TC or CIO site). Both of these design goals have been met. Also noted is the fact that the remaining 25 percent of the land mass is within a 75 mile radius, or less, of any audio entry point. Those areas that

are the greatest distance from either a Community Information Office or Teleconference Center most likely comprise from five to ten percent of the states total population.

The Teleconference Centers and Community Information Offices are located in areas that will give the residents of Montana quick and efficient access to audio teleconferencing and data base access. As will be covered later on in this report residents can telephone local Community Information Offices (generally a local call) for many information requests. This configuration increases systems usage. In all the balance of population and geographical distribution described should support the many needs that a telecommunications system such as the Montana Information Network will help address.

DATA BASES AVAILABLE FOR LINKAGE

This requirement phase covers the data bases that will be available, generally over a switched line (a standard telephone line that is dialed from the site requesting information), from each of the eleven Community Information Offices. Data bases are large banks of information held in memory in a computer. They contain information on a number of fields and can be cross-referenced by the computer operator for economy of time and cost savings. Most data bases can be searched, that is scanned or browsed, in a matter of minutes compared to hours for manual searches that might yield the same information. It is also typical for computer data base searches to search ten to a thousand or more the number of reference works that would be searched by hand for a given time period.

Libraries throughout the world provide citations in the form of card catalogs, bibliographies and other indices for information location and retrieval. As such manual searches, due to time restrains, limited staff, physical plant size, reference sources on hand and the lag time to print, make it virtually impossible for a complete cross-referenced source citation list to be produced. Computer data base

searches make it possible, by bringing together in a few data bases, all of the information found in hundreds to thousands of sources. The memory of a data base computer can hold millions of words of print on a disc, a device that looks much like a phonograph record, by electronic means. This "electronic memory" can be arranged in several different formats for display on a computer terminal and/or print on a computer printer. (Computer printers operate at speeds of several inches per second to several feet per second.)

In the appendix entitled A Sample Listing of Available Data Bases more than 150 data bases are listed with a topical description. However, data bases cover most any area of interest. A few are:

Agriculture
Business
Medicine (veterinary and general medicine)
Economics
Legislation
Energy
Environment
Forestry
Ranching
Social Sciences
Electronics

Information is gathered and recorded in data bases from:

Journals	Grants
Books	Government Legislation
Theses	Hearings
Conference Papers	Newspaper Articles
Patents	Summaries of Research in Progress
Annual Reports	Statistical Data
Maps	Voting Records
Contracts	Reviews

The following is a list of the companies or agencies offering more than five hundred data bases available for searches at the present time:

Systems Development Corporation
National Agricultural Library
Nat Library of Medicine
Bibliographal Retrieval Service
Lockheed Information System
Information Access
Washington Library Net
Pacific Northwest Bibliographical Center
Library of Congress
National Union Congress Library Center
Legis-Late
West Law
Lexis

In many cases a full abstract or summary of the document requested can be printed at the requesting site.

Another option would be to have the document(s) printed at the computer site and air mailed the same day. This provides management flexability in each Community Information Office. Other options allow for the document to be requested directly from the originating source during the search. In this mode the vendor mails you a copy and bills the Montana Information Network directly.

As mentioned in the opening paragraph these several data bases are accessed over standard telephone lines; however, state tie-lines or WATS lines can be used in association with national networks such as TYMNET or TELENET at costs of between five to eight dollars per hour. The costs per data base range from $35 to $300 per hour of connect time (straight time) with the average being about $70 per hour for most data bases. A few of the data bases are available from the federal government at no charge, other federal data bases must charge a small user fee as mandated by law. Again, most data base searches take only a few minutes.

Once information from any of the CIO's has been recorded locally it is then sent to Helena and compiled on the Montana Information Network's own data

base. This will generally mean that once a specific question has been asked from any CIO and recorded in Helena no one need go to the same data base again for the same question. This depends on the copyright attached to each data base. In this configuration information will be requested first from the Montana Information Network data base in Helena and if not found in the Helena data base then the user will dial-up the data base(s) of interest, again from any CIO site.

All of the data bases use simple, common sense English commands for searches. The user must only have a good working knowledge of English to access, search, print-out and sign off of any data base for the information requested. It is the job of the Information Officer to assist the user as required. Experience has shown that if the general public is introduced to computer terminal operations in a patient and low-keyed manner the frequent user requesting information needs little or no assistance during future searches.

TECHNICAL CONSIDERATIONS

Technical considerations take into consideration two main areas of interest: 1) audio and data terminal equipment and 2) network line configurations. Heavy consideration is given to future adaptability for systems growth and expansion for DTE (data terminal equipment). In this report network configuration was based on present day state-of-the-art transmission in Montana, which, for the most part, is in the early stages of systems development. The option of designing another network configuration would not be based in reality for systems deployment or costs analysis. Also, design characteristics are listed generically.

Audio Teleconference Equipment

The characteristics for an audio teleconference set are:

- portable
- dialable (can be dialed like a standard telephone)
- extension microphones controlled from set
- speaker with volume control

Such a set, as described above, can be carried to any room for a teleconference and be accessed from a remote site without the need for a special console or dedicated (leas-

ed) line. The only other technical requirement is that a phone jack be in the room where the teleconference is being held. An audio teleconference set that is dialable (the phone company would say that it had a "ringer") can also access another dialable teleconference, a standard telephone or a console. This adds great flexibility.

Facsimile Transcievers

Facsimile transceivers send and/or receive printed material from one point to another, generally over standard telephone lines. The characteristics for a facsimile transceiver are:

portable

speed compatibility

A portable facsimile transciever can be used in association with any audio teleconference equipment. Portable units are hand feed one sheet at a time and take anywhere from one to six minutes to either send or receive a single page.

The latest models use the faster speed; however, speed compatibility is necessary when transcievers designed for differing transmission speeds are used on the same line.

The facsimile transciever used for the Helena office is not

portable and can be dialed by a remote site and receive copy without an operator present. Such a dialable unit can send several copies to a portable unit without operator assistance once the machine has been loaded and the portable, remote unit dialed. In a central office this time saving option is of great value.

Data Terminal Equipment (DTE)

Data terminal equipment most often refers to the computer terminal but also refers to any equipment at the end of a telecommunication link (generally a cable or telephone line) terminating in an office. This includes modems, printers, CRT's, keyboards, software interfaces ("cards") and the like.

The computer terminal must be interactive, that is carry on a "conversation" with the computer processing unit (CPU) that it is connected to at the other end of the telecommunication link or another interactive computer terminal. The terminal must also be buffered (able to store information entered into the terminal and transmitted as one single unit instead of character by character to the CPU or another terminal) and able to talk in a synchronous or asynchronous mode at speeds of 2400 baud for synchronous

transmissions or 1200 for asynchronous transmissions. The synchronous 2400 baud will be used for intra-state transmissions and the 1200 baud line speed for out-of-state data base connections in an asynchronous mode.

The computer terminal must be able to use one of two "modems" (a modem makes it possible for a computer terminal to talk to a CPU or another computer terminal over standard telephone lines by modulating and demodulating analog and digital wave forms): the 1200 baud asynchronous for out-of-state data bases and the 2400 baud in-state synchronous transmissions to the data base in Helena.

A letter-quality printer is necessary for office automation and replaces the standard office typewriter. Such a printer should also be able to use a tractor feed for copying large amounts of data on fan folding paper. It is also important that letterheads be automatically feed to the printer. Such labor saving devices reduce secretarial time by margins of forty to one.

The CRT (video screen) should be able to display 128 character per line and 24 lines per screen. The keyboard should be of good typewriter quality for fast typing and offer

optional keys for screen and program manipulation.

The terminal should function as a stand-alone unit for local office administrative functions and will require space for program and file storage. This can be done on a hard disc located in the Helena office and serving all terminal users or memory can be provided in the local office on "floppy" disc. The local memory, or floppy disc, will provide an advantage in being independent of system failure in a central location or other reasons for system down time (program editing, telecommunication link failure). For these reasons two floppy disc are recommended (one for the program memory and the other for the local information file). This two disc configruation is a proven operational mode for stand-alone units.

Software, or systems program(s), should provide the following:

- text processing
- report processing
- communications (asynchronous/synchronous)
- math/statistics computations
- electronic mail (terminal to terminal messages)

As mentioned earlier both the Teleconference Centers and Community Information Offices will have audio teleconferencing equipment and facsimile transcievers. The Community Information Offices will also have the data terminal equipment. All equipment is common to the Helena office.

Network Configuration

The network design uses the existing state network which is, for the most part, point to point with a few clusters entering trunk lines in some of the larger cities of Montana. No doubt a multidrop network with multiplexing covering the state would offer advantages over point to point configurations; however, it was a design goal to use available communication links. To design and implement a new telecommunication network is another project in its own right and is simply not within the scope or time frame of this report.

Audio Teleconference Multi-Port Dial Equipment

The multi-port dial equipment is used to dial one to several audio teleconference units located in the Teleconference Centers and Community Information Offices.

Initiating communication is done simply by dialing a telephone number to call a single unit (teleconference set) or dial more than one unit at a time as determined by programming. The multi-port dial equipment is located in Helena and is the control center for the Montana Information Network as developed by this report for audio teleconferencing. An interesting feature is that any telephone, located anyplace in the U.S., Canada or any other nation, can be patched into a teleconference.

MODEL DESIGNS

This requirement will present three model designs for the Montana Information Network: 1) as needed audio teleconference sites (the Teleconference Centers noted already in this report), 2) full time audio and data telecommunication centers (Community Information Offices) and 3) one and two way real-time video interfaced into the Community Information Offices.

Teleconference Centers - Model 1

The sixteen Teleconference Centers will each use a public room (public school, library, civic center) on an as needed basis, that is when a teleconference has been scheduled for that particular location. A teleconference moderator must be recruited and trained in each of the sixteen locations and be "on call" for scheduled telconferencing. The moderator, after receiving notice of an upcoming teleconference will place public notices as required (press, radio, community bulletin boards, telephone calls, mailings), arrive at the teleconference site thirty minutes before the hearing or meeting begins and set up the equipment which consists of a portable teleconference set and a portable facsimile transceiver. The moderator,

once connected into the teleconference network by Helena personnel, will then make an audio check of the teleconference set and then inform the chairman or group leader of the number of participants expected to be present for the teleconference. The moderator, acting as an extension of the teleconference chairman or leader, may assist the chairman as he or she requires, that is explaining the need for site rotation of speakers, time limits, a call for, or distribution of, documents, teleconference sign-ins and the like. This is the basic teleconference site operation.

Other duties of the Teleconference Center moderator will be to make daily teleconference network check-ins. This can be done from the moderators home as the teleconference set needs only to be plugged into a telephone jack. The same is true for the portable facsimile transceiver. On a weekly, or bi-weekly basis, sign-in sheets and other supporting documentation will be mailed to the Helena office from each site. The moderator will also be responsible for introducing the general public to the use of the teleconference set; however, only the moderator will use the facsimile equipment.

The moderator will be paid, at a minimum, one hours wages for each daily check-in and three hours wages for each teleconference. This includes two hours of teleconference preparation time (notice to the public, set-up time and tear-down time) for a one hour teleconference plus any additional time if the teleconference lasts longer than one hour.

These as needed teleconferences can be rotated among several of a towns public rooms. The only physical requirements are that a telephone jack be in any room used, that enough tables and chairs be provided to accomodate any participant and restroom facilities be close at hand. Of course, the more central the location and the easier its access for senior citizens and the handicapped the better. If, for example, it is known that a handicapped person will be a witness then easy access must be provided, especially if the teleconference is for handicapped people. This can often be done by selecting a site on the first floor of a building with a ramp entrance. The need for this consideration, especially during the winter months, is very helpful to the network for public support.

Community Information Offices - Model 2

The Community Information Offices will have a full time Information Officer and an Assistant Information Officer who will be employed part time. All of the duties of teleconference moderating are identical to the Teleconference Center moderators noted above. The Information Officer will be the main link of the general public to the data base entry using the interactive computer terminals in the office as well as an active promoter of both the CIO's and TC's. This last requirement demands good public speaking and writing skills and an eagerness to assist the public in seeking the information they request. Often the information will take a rather vague, ill defined request and transform the request into the correct terminology. This is especially true in the legislative process and the social science areas. It is extremely important to note that this must be done with the person requesting the information in a gentle manner. In the same vain the Information Officer makes aware all of the information available to the requesting party but does not formulate an opinion for, or to, the requesting party.

It is the job of the Information Officer to explain

proceedure without giving opinion, to assist without interference and to listen, patiently, to the needs of the public. In short, the Information Officer shows the public, when required, how to accomplish a goal, or make a point known.

The Information Officer in each CIO is the Office Manager and is responsible for recruitment and training of the Assistant Information Officer with assistance from the Helena Office. He or she must be familiar with, or become familiar with, interactive computer terminals and office automation as all of the routine office paper work will also be done on the computer terminal. In this mode there is not a need for a standard office typewriter in the office. This will reduce clerical help on the order of forty hours to one hour.

The physical size of the office will be 600 square feet and can accomodate 14 teleconference participants, plus two staff personnel. The office can serve as a meeting place for both members of the executive and legislative branches of government with limited clerical assistance. However, Information Officers are not to serve as legislative or executive staff members beyond their duties related to audio

and data entry points. A non-partician policy should be developed. This is necessary to serve all of the public well and equally. All staff, at any level in the Montana Information Network, must be free of political pressure for job recruitment and retention.

Community Information Offices - Model 3

The addition of one and two way real-time video to the CIO's is the third model. It should be noted that the addition of video, especially two way real-time video, is an option that will require massive amounts of money, labor and equipment. In Montana, at the present time, no real means exists to bring a separate video channel into each CIO. Two way real-time video will add $350,000 to $400,000 per CIO plus satellite transponder costs (presently between one to three million dollars per year) if a transponder can be found for lease. The best option, for the next five years, would be one way video originating from Helena using commercial television studios throughout the state for broadcast transmitters. In this configuration the local CIO's would receive the video and respond over the audio teleconference network. But even this option would require that the transmission from Helena would be beamed to the commercial

broadcast stations in Montana through a satellite transponder, if one is available for lease. This option would also require Montana television stations to sell air time on an infrequent, and perhaps, random, basis.

An interesting aside is that people using both audio teleconferencing and video teleconferencing prefer, for the most part, audio teleconferencing over video links. (Personal information gained by the author after two years experience in the Alaska Legislative Information Network, which uses both audio and video teleconferencing modes.) In this age of massive television exposure one tends to forget how rich and varied the human voice is in conveying ideas, thoughts and impressions regarding any subject. It is also noted that the public adapts very well to audio telecommunications but not to video telecommunications: simple too much emotional energy is vested into sitting in front of a camera, if, and it is a big if, you can get the general public to sit in front of a camera. For the high profile public servant this is a necessary and learned adaption, for the general public it is not.

Considering how cost effective and useful audio and

data telecommunications are it is best to restrict video communications for public use at the present time. It is the authors opinion, with the exception of one way real-time video for use by high profile public officials, that two way real-time video is not necessary to communicate todays concerns as related through the Montana Information Network.

As developed in this report the Teleconference Centers and Community Information Offices offer 27 audio teleconferencing entry points and eleven data entry points for the general public: models one and two provide a high degree of public access for information gathering and communication.

MANAGEMENT CONSIDERATIONS

The Montana Information Network is a decentralized telecommunications network utilizing both audio and data links for information retrival and communication. For the MIN as a whole interaction with the general public will be higher than in many other agencies or companies and this will bring about the need for management policies that reflect both the speed of information transmittal and the evolving need to accept and promote management decisions not made in a single location. The use of the word evolving is deliberate: as more and more people gain information that is applicable to their needs, and the means to convey their thoughts and concerns about decisions and actions that reflect their needs, the more people will be involved in decisions that affect them directly. As mentioned earlier, this will demand that the network (already decentralized by technology) will become increasingly distributed, that is various decision making functions carried out in one central location will now be shared with the modes of the network and the people taking part in network activities. For government and non-profit organizations this managerial distribution seems particularly well suited.

The same goals of traditional, centralized management (economy of scale, coordination or interdependent activities and a balance of lower level goals against higher level goals) remain the same but the methodology used to implement managerial preogerativities is now shared, or distributed. The short of this is that traditional management must adapt to decentralization. In the early use of telecommunications this necessary adaptation was not realized and/or not appreciated. This, has lead, in the past, to considerable heartache on the part of many agencies and companies. It is the goal of management to grow with the telecommunications system they deploy.

The management staff in Helena will consist of five people:

Director

Programmer

Teleconference Coordinator

Moderator

Secretary

Other staff members will be (for each of the eleven CIO's):

Information Officer

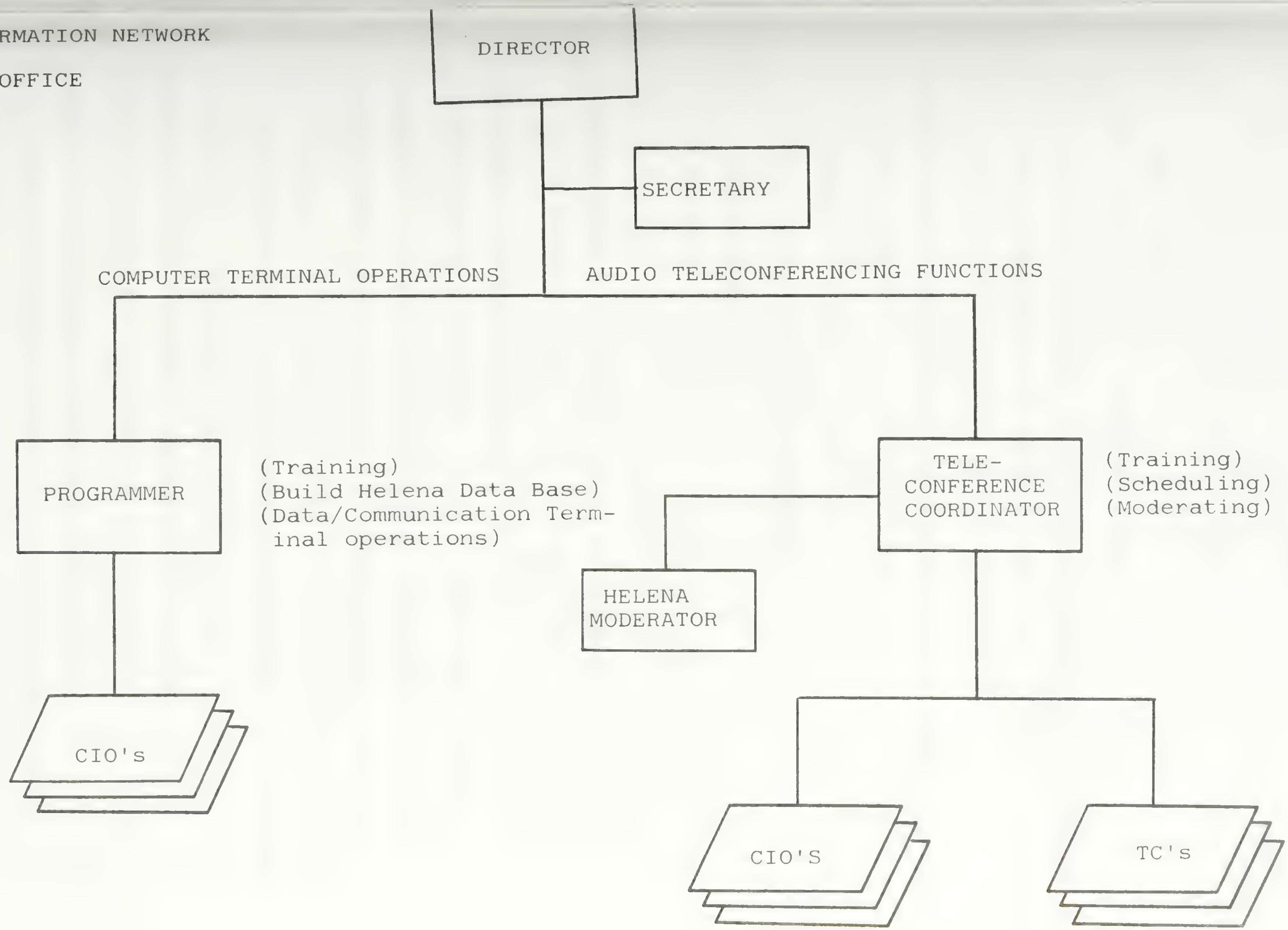
Assistant Information Officer

The sixteen Teleconference Centers will each be staffed with permanent, part-time positions entitled:

Moderator

MONTANA INFORMATION NETWORK

HELENA OFFICE



The salary range is suggested to fall between steps 12 and steps 18. In all 43 people will be employed to bring an effective telecommunications network easily accessable to 75 percent of the people of Montana.

The director is responsible for overall coordination of the Helena staff, the Community Information Offices and the Teleconference Centers. This includes recruitment and training, scheduling and planning for future needs and systems flexibility. However, a major duty of the Director is liaison with both the executive and legislative branches of government as well as the general public. The Director must have experience with audio and data telecommunications, office management and the general public. Strong public speaking and good writing skills are demanded. It is suggested that some sizable portion of his or her background be in hard sciences and that he or she be well read in diverse areas, say from the arts to anthropology to physics. In short, this individual is going to be unique, perhaps with an unorthodox background and with a considerate but independent frame of mind.

The Programmer will be responsible for computer operations, computer terminal training and building a data base for information requests and retrival for the Montana Information Network. He or she will be responsible for the data telecommunication coordination throughout the network.

The Teleconference Coordinator will be responsible for audio teleconference operations and the training of all moderators, both the Information Officers in their role as moderator as well as the Teleconference Center moderators. This will include teleconference scheduling on a routine basis. The teleconference coordinator will, at times, moderate Helena teleconferences.

The moderator in Helena will share similiar duties to his or her counterparts in the rural Teleconference Centers, primary responsibility will be the setting up of teleconference equipment in various Helena locations, signing in of teleconference participants, distribution of documents, assist the conference chairman as needed and the tearing down of equipment. The moderator works under the direct supervision of the Teleconference Coordinator.

The Secretary assists the director as required.

The Helena staff assists the CIO's and TC's as required. Experience has shown that this can best be done with daily, informal audio teleconferencing for administrative purposes. The 'espirit de corps' that is generated from unstructured conversations can rival the best team effort in any organization.

TRAINING AND FAMILIARIZATION

Training refers to staff training and familiarization refers to the user, that is government agencies (both legislative and executive) and the general public. Staff training is an ongoing process that begins with a formal training period, generally two to three days in Helena and is provided by the Helena staff. User familiarization is more diverse and is carried out through the media (press, radio, TV), public speaking and open-house in the Community Information Office. User familiarization is also an ongoing process.

The director in Helena will be the principal user liason in the greater Helena area and the Information Officer will do likewise in their area of operations as well as the area of operation for the Teleconference Center(s) nearest their CIO sites. In this configuration the TC moderators will not introduce audio and facsimile telecommunication capabilities to their local public. The director will assist the Information Officers in many of their public speaking rolls, especially during the first year of operations.

In the appendices of this report are two documents that cover in some detail data terminal training

(A Training Manual for Community Information Officers) and audio teleconferencing moderating (Audio Teleconferencing: Proceedures and Protocols). The manuals are performance oriented, that is the audio and/or data telecommunications operator works on the same machines to perform the functions being learned and the training continues once the Information Officer or Moderator returns to their Community Information Office or Teleconference Center.

As mentioned in Management Considerations, the Director has the overall responsibility for recruitment and training, however, the Programer in the Helena Office will train personnel in computer terminal operations and the Teleconference Coordinator will train audio teleconference proceedures. It is interesting to note that audio and data terminal proceedures are quickly learned if taught in a patient and low-keyed method.

Other areas, not covered in the two areas mentioned above, such as Management Information Systems, Office Automation, will be developed. Public Service Announcements, both audio and video, should be developed for media distribution as well as newspaper articles. A logo design, for letterhead and poster use, will establish a link between the general public and the

Montana Information Network. The initial user introduction to telecommunications will take about a year with follow-ups through the second to, perhaps, fifth years following system development.

COSTS ANALYSIS

Some of this requirement phase is straight forward: line charges, data terminal equipment costs, computation of suggested job grades, ect. . .while other areas, most notably estimates of teleconference hours per month and out-of-state data base use are indeed subjective on the part of the author. However, this subjectivity is based on two years of experience as a teleconference moderator and Information Officer for the Alaska legislature. It is interesting that demographic similarities (distribution of population, seasonal lifestyles, a "western" attitude) exist between Alaska and Montana. The costs analysis that follows is formed from experience, both technical and managerial, to give the most realistic estimates possible.

Costs comparisons are based on fiscal year 1980 in-state travel expenditures for Montana government officials. In this regards the analysis considers only the first phase in the evolution of a telecommunication systems deployment: the savings in routine travel time and costs. This limit-comparison does not take into account increased productivity, with the exception of time and monies saved as mentioned above, resulting from increased dialogue and increased

awareness for both government employees and the general public. There is, at this time, no real method to measure the increase in public productivity resulting from eleven data entry and retrival points (the Community Information Offices) useful for any number of private/public/economical concerns. Still, the savings resulting from state employee use is considerable and should more than pay for the cost of such a telecommunication system deployment and offer a reduction in government costs realized at the end of the first year of use.

In fiscal year 1980 the state of Montana spent $10,342,500. in in-state travel. Expenses for personal car and state motor pool cars totaled $3,280,000. with more than 16,400,000. miles traveled. This is equivalent to 159 work-years or (estimating $15,000. per year salary) $2,385,000. in salary for travel time in addition to the ten million dollar figure noted above. In contrast the first year deployment costs for eleven Comminity Information Offices and sixteen Teleconference Centers is estimated at $1,378,000. This includes $370,000. for one time purchases of furnishings and audio/data electronic equipment. It is the contention of this report that end of first years savings, following telecommunication systems deployment, for state government agencies alone would be $3,413,000. in travel costs and

$787,000. in salary costs. This is a one-thirds savings in state tax dollars used for travel costs. The dollar figure is $2,822,000.

Depending upon the needs of state agencies and management practices use of a telecommunications system with audio and data interface could save from between 30 to 80 percent of all state travel costs. A savings at the end of first year deployment should be 30 percent at a minimum.

A teleconference arranged by common carrier (the Bell system) to 27 locations in Montana at an average of 300 miles apart for three hours would cost $3,369. compaired to $702 using the audio teleconference network developed in this report for line charges alone.

The Montana Information Network, as developed in this paper would employee 43 people for a yearly cost of $611,000. One time purchase of audio/data equipment and office furnishings are set at $370,000. with line charges (state WATS, tie-line) of $59,000. for audio teleconferencing, $52,000. for out-of-state data base retrival and $116,600. for in-state data base and electronic mail use.

Your attention is directed to the following costs of line items for the CIO's, TC's and Helena office.

COSTS; Teleconference Center

	Month	Year
Salary, grade 12, title Moderator, based on 40 hours per month (computed with 18.5% load)	$474	$5,688
Facsimile transciever, portable (amortized over 12 months)	208	2,500
Audio teleconference set, (can not be purchased at this time)	35	420
Line charges, 26 hours per month at $0.15 minute (state tie-lines, WATS only)	234	2,808
Paper supplies, ect...	15	180
	$966	$11,596

First years costs for one TC	$11,596
number of sites	X 16
Total years costs for 16 sites =	$185,536

COSTS; Community Information Center

	Month	Year
Salary, grade 14, title Information Officer (computer with 18.5% load)	$1,738	$20,856
Salary, grade 13, title Assistant Information Officer (computed with 18.5% load)	1,639	19,671
	$3.377	$40,527
Facsimile transceiver, portable (amortized over 12 months)	208	2,500
Audio teleconference set (can not be purchased at this time)	35	420
Computer terminal, interactive, with keyboard, CRT, two eight inch floppy disc, letter quality printer (80 character per second), software (amortized over 12 months)	1,042	12,500
Modem, asynchronous 1200 baud	100	1,200
Modem, synchronous 2400	150	1,800
Telephone, "Touch-O-Matic 32", with speaker phone, dial tone detector, two each	40	480
Telephone installation charge (one time only)	N/A	95

Line charges, office telephone (all mode: tie-line, WATS, switched)	200	2,400
Line charges, out of state data bases for 60 five minute per month at five hours total (average $70 per hour) plus five hours telephone charges (TYMNET, TELENET, WATS)	435	5,220
Line charges, to in state data base in Helena, 108 hours per month using state WATS, tie-ine only at $0.15 per minute	972	11,664
Line charges, teleconference, 52 hours per month using state WATS, tie-line only at $0.15 per minute	468	5,616
Furnishings, for CIO office	584	7,000
Mailings	100	1,200
Paper supplies, ect...	100	1,200
Office space rental plus utilities	450	5,400
Copier, 12 copies per minute on standard paper	292	3,500
	$8,553	$102,722

First years costs for one CIO	$102,722
number of sites	X 10
Total years costs for 10 sites =	$1,027,220

COSTS; Helena office

	Month	Year
Salary, grade 18, title Director, fulltime (computed with 18.5% load)	$2370	$28,440
Salary, grade 17, title Programmer, full-time (computed with 18.5% load)	2222	26,663
Salary, grade 16, title Teleconference Coordinator, fulltime (computed with 18.5% load)	2044	24,530
Salary, grade 12, title Moderator, full-time (computed with 18.5% load)	1462	17,538
Salary, grade 12, title Secretary, full-time (computed with 18.5% load)	1462	17,538
	$9559	$114,709
Facsimile transciever, portable (amortized over 12 months)	208	2,500
Facsimile transciever, non-portable auto-dial/auto answer (amortized over 12 months)	567	6,800
Audio teleconference set, two each (can not be purchased at this time)	70	840

Computer terminal, interactive, with keyboard, CRT, two eight inch floppy disc, letter-quality (80 characters per second) printer, software (amortized over 12 months)	1042	12,500
Modem, asynchronous 1200 baud	100	1,200
Modem, synchronous 2400 baud	150	1,800
Telephone, "Touch-O-Matic 32", with speaker phone, dial tone detector, three each	120	1,440
Line charges, office telephone (all mode: tie-line, WATS, switched)	500	6,000
CPU charges, state computer for data base	500	6,000
Mailings	200	2,400
Paper supplies, ect...	200	2,400
Copier costs	100	1,200
Telephone installation charge (one time only)	N/A	143
Teleconference Multi-Port Dial Equipment	355	4,260
Teleconference Multi-Port Dial Equipment installation charge (one time only)	N/A	2,243
	$13,671	$165,355

APPENDIX A

Audio Teleconferencing:

Procedures & Protocols

Montana Community Information Offices
and Teleconference Centers

AUDIO TELECONFERENCING

MODERATOR PROCEDURES AND PROTOCOLS

As a teleconference moderator, your duties are manyfold and must be performed with professional care. You will often be working in the presence of legislators and a varied array of government and/or local citizenry.

Most often, teleconferences are public hearings and will require moderator assistance with publicity and coordination. Other teleconferences may be legislative committees holding working sessions, other agencies having policy or planning meetings, or a non-profit group gathering to discuss a special topic. Subject-matter varies as do eligible users. The network is available year-around and on a priority basis to the following users:

Montana State Government Agencies
Public and Non-profit Organizations

Priorities will be worked out among the three branches of government before scheduling.

Due to the various types of teleconferences, some will not require publicity assistance, but will require calendaring and other tracking by the moderator.

AUDIO TELECONFERENCING

Scheduling

Requests for teleconferences are scheduled through the Helena Teleconference Office only. When an audio teleconference is scheduled that includes your location, the following procedure takes place:

A copy of the contact sheet is telecopied to you from Helena with all pertinent information on it. For the CIO's a notice will have been sent to you on the data terminal prior to that. A master file is kept in Helena.

Make a file for this contact sheet, to which you may add updates and documentation later.

Mark your calendar showing date, subject and time.

Proceed with special publicity and/or local contact instructions, as indicated on your

contact sheets.

Make posters and post when and where appropriate.

Following the scheduling process, you will be advised by Helena of updates, cancelations, pre-emptions and other information - either by CRT, telecopy or the audio teleconference network (hereafter referred to as the ATN)

If a teleconference request is made through any office other than Helena, encourage the requestor to call Helena direct. However, you may forward requests to Helena via the ATN or data terminals. Be sure to include all the pertinent information.

Publicity

Copies of the Public Service Announcement Directory should be in your office as an aid to local ATN users. This directory is provided to assist and encourage ATN users to fully utilize the media in publicizing public hearings.

You may be asked to make some local telephone calls to special participants and/or media sources.

You will be provided with copy of any related news releases or public service announcement prior to the scheduled teleconference. Users will be asked to write and distribute their own PSAS and news releases, however, we will assist with PSA distribution in those communities where it is timely and practical.

If the scheduled teleconference is a public hearing, post a copy of the news release or PSA in your office, on a window, a door, bulletin board or wherever public can best view notices. On the day of the hearing,

be sure to post a notice with the title, "Today's Hearing", on your window or door too. Also, if you have a reception area or table for public access in your office, utilize this to place copies of notices, publications, ATN schedules and the "Teleconference Site Directory".

Beyond specifics noted above, use your own initiative and talent in representing the ATN in your community. Use your own good judgement and discretion in making teleconference information as available to your community as possible. For example, some sites distribute a weekly teleconference schedule in their communities, either by mail, newspaper or posting copies.

Equipment

Teleconference equipment in your office or center should include a conference set with green and gold mikes as separate attachments. To avoid room noise and other interruptions during teleconferences, it is best to leave mikes off when in "listening" mode, that is, at all times other than when mike is being used.

The ATN circuit is owned and maintained by Mountain Bell. It terminates into telephone company facilities in the various ATN communities, and it is your local telephone man who maintains and repairs the cable and modular jacks in your office.

Calling another site: Standard procedure is to turn on your conference set each morning, or when you come into your ATN center, and stay on the network throughout the day. However, the 931 hotline allows us to leave conference sets off when desirable, in order to be actually called, as with your standard telephone.

Privacy: With special equipment in the Helena teleconference manager's offices, "Privacy" may be implemented. Only those sites specified for a given teleconference will be on the circuit, with all others excluded. This can be controlled by Helena only.

Off-Net Dialing: This feature enables communities that are not part of the dedicated circuit to be included in a teleconference. Only Helena can access special codes that enable them to literally dial

a distant telephone number and include it in a teleconference. These calls may be dialed from Helena.

Other equipment used in association with the LTN is the telecopier. The telecopier is used for document exchange, schedules and various written materials that are pertinent to your teleconference purposes.

More detailed and specific equipment instruction is available through the ATN Coordinator. Essentially, all procedures are simple and moderators need not have great technical knowledge to operate the apparatus.

In addition to your teleconference equipment, Community Information Offices are equipped with a computer terminal for data base collection, inter-office mail and office automation.

If you have problems with any of your equipment, or it fails, report to the ATN Coordinator at once. Do not call the local telephone company.

Teleconference Procedure

Prior to the day of the scheduled teleconference,

check with the Helena office to be sure you have the proper documentation, and other back-up materials on hand for your participation. Be sure to review materials so you can answer basic questions from the public about the teleconference.

Then, on the day of the scheduled teleconference...

Prepare your room for participants, setting up equipment, chairs and tables in a meeting-like atmosphere.

Set aside a place (near the door) where participants can sign-in and pick-up any materials relating to conference subject. Also have on hand evaluation sheets and the "Teleconference Procedure" sheets.

Review your file on the teleconference so that you are fully aware of subject matter, sites, participants, the chairman, etc. Make some follow up calls in your community if you deem appropriate, particularly if teleconference is a non-publicized "work session..."

Equipment should be set-up and mikes tested 15 minutes prior to start of the teleconference.

Set aside other office duties so you can concentrate on greeting participants and answering their queries.

Prior to the meeting, after the participants have gathered, acquaint those who will be using mikes with their operation.

If the meeting is being chaired from your site, you are designated as the "Primary Moderator" and will give pre-meeting "warm-up" to all sites, briefly familiarizing participants with the ATN procedure. You will also greet the chairman, review the meeting plan, and assist with any needs he or she may have prior to and during the teleconference. (This might include telecopying some last-minute documentation.) Be sure you and your equipment are situated close to the chairman's position at the table.

Primary Moderator Responsibilities

As the primary moderator, you are critical in setting the "mood" of the teleconference.

Be sure you have discussed with the chairman how he/she wants to handle the teleconference. For example, will the chairman poll the sites or will the Primary Moderator? Is the teleconference to be formal or informal? Listeners can tell if you are bored or flustered by your voice.

Pre-Teleconference. On the day of the teleconference, confirm with the chairman the time, location, and any special instructions, such as limits on testimony, etc.

Polling should begin 5 minutes prior to the teleconference. At this time you should check to make sure all microphones are working as well as update the sites on any new information you have. Confirm which sites will be participating and the number of witnesses at each site. Approximately 1-2 minutes before the teleconference, give a warm-up spiel verifying the user, subject, sites included and any special instructions.

During the Teleconference, you are responsible for all the usual moderator responsibilities in addition to the following:

- Be sure to closely monitor audio quality from all sites.
- Make sure your "warm-up" spiel asks everyone to initially identify themselves.
- If testimony is being taken, keep track of who has testified from where. Try to make sure that no sites have to wait too long before being polled.

Post Teleconference. Be sure to note how long the teleconference lasts and which sites where included in the teleconference. Send the information to Helena Teleconference Manager.

The chairman controls the meeting format, dialogue and content. The primary moderator assists with equipment, materials and such things as monitoring time, and in particular, acts as an extension to the chairman by recognizing those witnesses who

wish to speak. A typical format followed at committee hearings may go like this:

.....Following the introductory remarks upon opening the meeting, the chairman will poll the teleconference sites. Polling will follow a sequence chosen at the chairman's discretion and which may not always be known by the moderators. It may take the following form....

A) The chairman will greet the first teleconference site with whom he chooses to speak and ask the moderator to confirm his information regarding number of participants and observers present.

B) The chairman will then instruct the moderator to ask the first witness to take a seat before the witness microphone and introduce himself.

C) The chairman will acknowledge the witness and ask him or her to proceed, or, if such is the nature of the testimony, he will recognize committee members wishing to question the witness.

D) When the witness's testimony has concluded, the chairman will thank him or her and instruct the moderator to ask the next witness to come forward.

E) When all testimony has completed, or all time elapsed, the chairman will thank the participants and poll the next site.

Things to remember during the teleconference....

A) Monitor your speaker's use of the microphones. Watch for closeness to mike, head movements, projection of voice. If necessary, adjust the position of the mike. Sometimes it's necessary to replace a mike. Maintain speaker's awareness to mike through eye contact and mike adjustments if necessary.

B) Monitor the incoming volume and adjust to maintain equal level. Anticipate the next site to speak and be prepared to adjust upward or downward before the first few words are lost or before listeners are blasted out of a peaceful reverie.

C) Watch for newcomers and give them participation

sheets, procedure sheets and answer questions. If there is a support person, he or she will be responsible for that, but frequently you are on your own.

D) Watch the rear of the room to be sure all can hear.

E) When you are called upon, be sure to respond rather than leave the network silent. For example, if the chairman calls your next witness, although you can see he or she is approaching the microphone, the chairman can't and hears only dead silence. Merely respond that "Ms. Smith is now approaching the mike".

F) If it turns out that you have a witness that speaks at great length, it's nice to have the green mike on the mike stand available for his or her use. It's o.k. to switch mikes during the teleconference.

G) If you are having difficulty in hearing a witness, do not hesitate to interrupt. Let primary moderator know! If there seems to

be consistent problems with audio levels, send a CRT marked "urgent" to Helena teleconference.

At the close of the teleconference meeting, be sure all participants have signed-in. If possible, review the meeting with the chairman and make notes where appropriate. Gather evaluation forms, sign-in sheets, notes, etc., and send originals of all to Helena. Copies may be kept in your file. In addition, if you have gathered local news articles or any other materials prior to the conference, mail these to Helena also. The ATN Staff then submits this information from all sites to the committee chairman.

Teleconference Forms

Forms are mentioned above; the following is the total list of all teleconference-related forms you should keep on hand in your office. When your supply runs low, contact the Helena office for more.

Contact Sheet

Sign-in Sheet

Evaluation Form

Teleconference Procedure Sheet

Other Documents For Your Use

Public Service Announcement Directory

Primary Moderator Warm-up Sample

Teleconference Site Directory

APPENDIX B

USER AUDIO TELECONFERENCE HANDOUTS

MONTANA INFORMATION NETWORK

TELECONFERENCE PROCEDURES

Participating in a teleconference is a relatively simple procedure, with only a few basic rules and protocols required for effective participation. Please note the following:

HAVE YOU SIGNED-IN? Witnesses and observers should complete sign-in sheets.

TO BEGIN A TELECONFERENCE Prior to the beginning of the telemeeting, the Primary Teleconference Moderator will poll each of the participating sites and share pertinent information. The teleconference is then turned over to the meeting/hearing chairman, who calls the teleconference to order and proceeds with his or her agenda (which has previously been copied to each site).

ORDER OF APPEARANCE The Chairman will announce the order of witness participation, and call upon each site when appropriate.

TIME LIMITS The Chairman may request that testimony be limited to a certain length of time; it is important to participate within such constraints.

PROCEDURE When you are called upon to testify, take a chair at the nearest microphone, or, if you are already seated at the table, set the nearest mike in front of you. The Moderator will already have given instructions on the operation of the microphones.

Speak directly into the mike from a distance of about six inches.

Before beginning your testimony, state your name and who you are representing. Try to remember to identify yourself each time you speak.

Indicate to the Chairman when you have concluded your testimony.

There may be questions from the Chairman and/or other information exchange between sites. Pause briefly before responding to questions, to allow for lag in voice transmission. The system will not accomodate two simultaneous conversations.

TESTIMONY FROM OTHER SITES Testimony from other sites can be heard at all times from your teleconference center. Mikes are open here only when witnesses are testifying, but since some of the people attending are interested

in the testimony from other sites, please don't converse while other sites are "talking".

If you find it necessary to interject comment/response that is outside the planned agenda, to avoid undue interruption it is appropriate to signal or send a note to your Moderator, indicating your desire to so participate.

WRITTEN TESTIMONY Comments on bills, back-up material or other documentation on the teleconference may be sent to the Teleconference Coordinator in Helena. If the teleconference is a public hearing, written testimony/ material also may be sent to the Helena Office.

FUTURE TELECONFERENCES Teleconferences are scheduled and coordinated through the Montana Information Network in Helena.

*****TELECONFERENCES ARE NOT DIFFERENT FROM FACE-TO-FACE MEETINGS WHERE IT IS IMPORTANT TO FOLLOW THE AGENDA AND THE TOPIC. IF BACK-UP MATERIAL HAS BEEN PROVIDED PRIOR TO THE CONFERENCE, BE SURE TO FAMILIARIZE YOURSELF WITH IT, SO AS TO AVOID STRAYING FROM THE SUBJECT MATTER AND THUS CAUSING DELAY OR DETRACTING FROM THE MEETING.*****

MONTANA INFORMATION NETWORK

LEGISLATIVE CONSTITUENT MEETING

Welcome to the weekly/bi-weekly/monthly _____________ delegation teleconference.

Legislators participating from District ____ are _____ ______________.

To make the teleconference run smoothly, please observe the following items:

1. Print your name, address and phone number on the teleconference hearing form.

2. If you wish to join the discussion, please print your name and the name of the legislator(s) to whom you wish to speak and pass them to the moderator, who will notify you when you are to speak.

3. If there is a large number of people in attendance, it may not be possible to include everyone in the discussion each week, but we will do our best to let each person participate. You can help us by being concise and specific when it is your turn to address the legislator(s).

4. When it is your turn, use the mike provided. Hold it approximately 6 inches from your mouth speak clearly and slowly.

MONTANA INFORMATION NETWORK

AUDIO TELECONFERENCE

Please Print.
To be returned to Teleconference Moderator

PARTICIPATION FORM

NAME___________________________ Here to testify ___

REPRESENTING____________________ Here of observe ___

____

MAILING ADDRESS_________________________________Zip______

TELEPHONE NUMBER________________

BROADCAST CONSENT: This proceeding may be broadcast live or recorded for later broadcast by radio or television stations. Please indicate your consent by signing below:

____
(signature)

EVALUATION: Have you participated in other audio teleconferences? ____ If so, how many? _____________

How did you learn about this hearing?

____

____

Would you have participated in this hearing if the network were not available? _________

If yes, did you use the network

_______ instead of travel

_______ instead of phone conversations

_______ instead of mailed testimony

Are you also providing written testimony? _____

DATE_________ SUBJECT___________________ LOCATION_____________

MONTANA INFORMATION NETWORK

Date:

Location:

Subject:

NAME	REPRESENTING	ADDRESS	PHONE	HERE TO OBSERVE	HERE TO TESTIFY

PRE-TELECONFERENCE "WARM-UP"
for Users

Good __________. This is ______________ speaking from _____________, our primary (chairing) site for today's teleconference with ___________ on ___________(topic).

I'd like to welcome all of you who are participating today, and reassure those of you who may be first-time users of the Network. Please be assured that it is a simple proceedure and quite similar to a long-distance conference call.

When speaking into the microphone, it is not necessary to shout, but do identify yourself each time you speak. For best quality, speak clearly and pause briefly after each statement. Face the microphone and speak at a distance of about 6 inches.

____________ will be chairing today's t/c from _______________ and our local moderators are available to answer any questions you may have regarding equipment of the L.T.N.

Other sites besides __________ who are participating today are _________, ______________ and ______________.

Chairman __________will give you further information regarding the format and order in which sites will be asked to participate. We'll pause briefly now in case any sites are having technical problems or have any last-minute arrivals.

Thank you for your cooperation. At this time, Chairman ___________ will officially begin the teleconference.

PRE-TELECONFERENCE "WARM-UP"

Good ______________. This is ________________speaking from the Teleconference Center in ________________.

I want to welcome each of you who are participating in today's teleconference with __________________________(committee).

If you have not participated in one of our Montana teleconferences before, please be assured it is a simple proceedure much like speaking into the telephone.

When speaking into the microphone, it is not necessary to shout, but do speak loudly and clearly and pause as you are used to doing on the Long Distance telephone.

Sit back six inches from the mike, as comfortably as you can.

__________________________ will be chairing today's hearing from _____________________, plus we have teleconference moderators at each site standing by to assist with equipment and answer questions you may have.

The other teleconference sites participating in today's hearing are:

Site	Moderator

Chairman ______________ will give you further information regarding the format and order in which sites will be asked to give testimony.

We will now pause to answer any questions you may have of your local moderator, then Chairman ______________ will begin the meeting.

APPENDIX C

A TRAINING MANUAL FOR
COMMUNITY INFORMATION OFFICERS

Note - This training manual is for a classroom presentation and is to supplement data terminal equipment use in the classroom as well as visual aids.

INTRODUCTION

1. ABOUT THIS TRAINING MANUAL: This Training Manual for you, the Community Information Officer, concerns itself with the Theory of Operation, Equipment Operaation, Office Hardware Connections and Nomenclature and Trouble Shooting for the telecommunications equipment installed in your Community Information Offices.

2. TYPE OF TRAINING: This training is Performance Orientated, which means that you take part in your training from the beginning in an active way. This hands-on approach is the most effective way to learn technical material and yields higher comprehension during and after training than other methods, such as the lecture and handout method.

3. PLACE OF TRAINING: The first part of training begins here in Helena and will last throughout the next two days. There will be time for questions and coffee breaks. The second part of the training will take place after you return to your CIO's and is called Field Training Exercises or FTX. In this way training will take place where you will need it the most, in your offices. Good luck and enjoy.

THEORY OF OPERATION

COMPUTERS

Electronic computers have been in general usage for the past two decades but it has not been until the last five years that their usage has been expanded by the employment of telecommunications links, as in the Montana Information Network. Computers remain the brains of a system with telecommunications links operating like the nerves in the system. But how does this computer function?

Computers accept human information mechanically and convert this information into electrical energy. This electrical information is then processed internally into intelligence and delivered in a mechanical format at the request of the operator, again using mechanical means to address, or access the computer.

Yesterday the computing power that filled an entire room twice the size of a standard classroom can fit on the tip of your little finger today, not once but four times over.

There are, in general terms, two types of computers:

Microcomputers and Data Processing computers. The microcomputers are the first generation of computers. Microcomputers differ from data processing computers in the amount of information they can store and the number of computions they can do simultaneously. Microcomputers handle limited amounts of information and do only a few functions at a time. An example of a microcomputer is a hand-held personal computer or a desk top computer for a home or small business.

Data processing computers, referred to in this manual as computers, are the second generation of computers and handle very complex manipulations from very large memory banks storing a billion billion pieces of information. Computers of this size can answer hundreds of requests per second.

Microcomputers, sometimes called microprocessors, are used in communications networks. Our CIO office communications terminals are controlled by microcomputers. In this application microcomputers sort and store information for data processing computers. This front-end employment of microcomputers saves the data processing computers time and allows them to be used more efficiently. Microcomputers control the traffic in a telecommunications network.

TELECOMMUNICATION LINKS

Telecommunication links connect, essentially, one terminal to another terminal and, or one terminal to a computer. These telecommunications links use a variety of means to transmit the elctrical information that one terminal talks to another terminal or computer. A few are:

Land lines (telephone lines)

Radiowave transmissions

Microwave transmissions

Satellite transmissions

All of the above means of transmitting electrical information convey electromagnetic signals. Land lines, or standard telephone lines, send electromagnetic signals through wires and do not radiate their signal into free space. Radiowaves and satellite transmissions radiate their signal into free space. The difference between the above is the length, or frequency of the signals. The frequency can vary from a few hundred meters in length to a few centimeters in length. For reasons that are beyond the scope of this manual each of these separate means to transmit a signal offers some advantage be it convenience, economy or necessity.

Often, as in Montana, a combination of land lines, a

microwave and satellite links connect one CIO to another CIO. Two of the most common configurations are land line to microwave to land line and land line to satellite to land line. Getting a signal up to a satellite is called an up-link and getting a signal down from a satellite is called a down-link.

Land lines are used in the towns and cities of Montana to bring the so called "last mile" connection to and from the terminals in the CIO's. Connecting some cities are microwave links. These line of site links can be used to carry a signal to where it can be up-linked to a satellite. Microwave links are relayed everytime the signal must make a turn, as around the end of an island, or when the over-the-horizon angle interferes with line-of-site paths. The maximum distance possible by a single section of microwave transmission is generally less than a few hundred kilometers. Satellites, on the other hand, can cover a path 28,000 kilometers or three times the distance from New York to San Francisco. Communications satellites are in a fixed orbit, or geo-stationary orbit, 36,000 kilometers over the equator and it is this distance above the earth that gives them their range of transmission. Satellites are called birds in everyday conversations among technicians.

NETWORKS

A telecommunications network is the connection of one particular element, that is terminal or computer, to another element. Here, in describing networks, we are not so much concerned with the method to link one element to another element as the relationship of one element to another element.

There are two types of networks. Clustered and Distributed.

Two clustered networks can be linked together. One net is controlled in Helena, for example, and the other net in Billings. These two nets, both controlled by microcomputers, are up-linked via satellite, over microwave links.

The information net is centered in Helena where the large State data processing computer is located. The information net is a clustered network. Front-end employment of microprocessors are located in Missoula, Billings and Helena. As mentioned earlier this front-end employment of microcomputers enhances the operation of computers freeing them from many routine and clerical tasks, such as telecommunication

link control.

When computers, microcomputers and telecommunication links are combined into a network configuration the access cost to several users is affordable by time-sharing. In the last ten years computer costs have decreased ten percent per year. It is this tele-communication linkage that is underwriting the use, growth and development of computers. The employment of telecommunications if equivalent to the intro-duction of the printing press in the fifteenth century.

TERMINALS

By basic definition a terminal is any location in a network where information can enter and exit. This enter and exit ability is called a users input/output port. You may see this input/output contracted to an I/O. The other end of the line, again by basic definition, is called a computer. The length of line between the I/O port and computer may be only a few meters or several thousand kilometers.

A few of the many types of terminals in use today are:

Keyboard-printer

Keyboard-video display

Paper tape reader/punch

Card reader/punch

Line printer.

In this network the CIO's employ to of the above; they are the key-board, video display and line printer connected to the output port of the keyboard-video display.

A terminal, in addition to its I/O functions has one additional function called error checking. There are many types of error checking in use, but the most

common type of error checking is the counting of the total number of characters in the transmission. This total count is then sent to the receiver which counts the total number of characters received. If the count received does not match the count sent the message is automatically transmitted again. Part of a message can be lost by line interference. One common type of line interference is the build up and discharge of static charges. These static charges literally knock out pieces of message text.

When one terminal talks to another terminal or a computer they must be in synchronization. If the terminals are not in synchronization message texts can not be counted for error checking. This will result in the message not being received at the addressed terminal. Synchronization is often compressed to in-syn by technicians.

MODEMS

Now, after a look at computers, telecommunications links, networks and terminals we begin to look at some of the more interesting parts of telecommunication systems equipment. But first we will have to look at some of the electronic theory to understand how some particular pieces of equipment work and why they are necessary. This is especially true of modems.

You need to understand the basic differences between alternating current and direct current and also the difference between analog format and digital format.

Alternating current changes its direction of movement depending upon its frequency. For example, standard 120 volt house current is alternation current with a frequency of 60 cycles per second the house current completes 60 cycles, as shown below:

Direct current does not change in direction of movement, have a frequency or continuously change its amplitude (voltage), as shown below:

Why is this important? Why not just use either AC or DC and forget the other? Alternating current is

the only type of current that can be transmitted over wire or into free space. Alternating current amplitudes can be either stepped up or down in a transformer. Direct current will not pass through a transformer, and therefore cannot be transmitted any useful distance.

On the other hand electronic componets require direct current for their operation. This is especially true of solid-state devices used today.

This use of direct current in electronic components brings us into the employment of digital formats. All digital components count either a high or low direct current voltage. This high or low voltage in digital format looks like this:

As you can see the rise time for a digital format vs. an analog format is much faster. This makes it possible for digital components to make highly accurate counts of low and high DC voltage and is one of the many reasons for using a digital format over an analog format.

You can see an analog format is alternating current. Alternating current, or analog format, is used in the

transmission of signals between terminals while direct current, or digital format, is used inside the terminals.

The modem transfers information transmitted in an analog format into a digital format and from digital format into an analog format. In fact the word modem is a contraction of these two functions provided by the modem modulation and demodulation. Analog formats are modulated, that is the alternating current varies by both amplitude and frequency.

Digital formats, as noted earlier, do not vary by frequency and are demodulated. The modems are located near the telecommunications equipment in your office as direct current can not be transmitted any real distance. Each terminal or each computer must have its own modem.

Modems operate at different rates of information exchange. Different modes of transmission, that is satellite, microwave or land lines, can handle varing rates of information exchange. Just as a chain is only as strong as its weakest link. In Montana the lowest link is commercial land lines.

Land lines can carry 9600 bits-per-second, or bps. For example, information is exchanged between Helena and Missoula at 9600 bits-per-second. In your local office your terminal operates at the rate of 2400 bps or 1200 bps. This allows four 2400 (or eight 1200) channels of information to be exchanged at one time. With information held in storage, several terminals can use each channel by waiting only a few seconds at the most to transmit. Into each of your offices information can arrive at the rate of 2400 or 1200 bps. One modem, used for the intra-state net, handles 2400 bps. One 2400 bps modem goes directly into your terminal; the second modem also goes to your terminal but at 1200 baud for inter-state data base linkage.

2400 modems are required for intra-state terminals to operate. Remember, that other CIO's use the same 2400 channel for their communication terminals in the Montana Information Network and that transmission of data for any real distance between locations must be done in analog format. The connection to other communication terminals is done by way of a bridge. The bridge simply splits the 2400 channel into as many lines as needed for other terminals. The bridge may or may not be located

in your office. In splitting the communication 2400 bps channel into as many lines as necessary the bridge also maintains the voltage, or strength, of each line. This strength is maintained by passing the alternating current, or analog format, through a transformer. (Remember, direct current, or digital format, can not pass through a transformer.)

You can see that the 2400 bps modem directly feeds your information terminal. The 2400 bps modems in your office transfer information between analog and digital format for the intra-state communication terminals. The master modem sends the 2400 bps communication channel to the bridge. The bridge then addresses each terminal in analog format. The slave modem, located as each site, then operates that sites particular communications terminal.

Often technicians will speak of slave modems and master modems. Also, as the Community Information Offices may have the only information terminal (computer terminal) in rural areas, a system of slave and master modems is not necessary, only a direct feed from the 2400 bps modem is needed to access the computer terminal.

INTERFACE UNITS

The interface units used in telecommunication links regulate a number of specific line standards necessary to insure a good connection between terminals. There are twenty-five electrical characteristics that need to be maintained between terminals. In addition to providing standardized signal paths between terminals interface units allow modems of different electrical types to work in sequence.

Interface units may be deployed before or after modems. In Montana interface units are placed before modems.

CHANNELS

Channels used in telecommunications have two essential elements: Mode and Grade. A particular mode is the description of the actual path used to convey a signal from one point to another. Grade is related to the bps (bits-per-second) that can be obtained by a particular mode.

Depending upon the need today there are three types of modes used to carry information between points in a telecommunication link. There are:

Simplex

Half Duplex

Duplex

Simplex modes can transmit traffic in one direction only. Half-duplex modes can transmit in either direction, or receive in either direction, but can not receive and transmit at the same time. Duplex modes can both transmit and receive at the same time.

In each CIO there are two two wire (duplex) modes serving the office. One half-duplex mode is used for the teleconference network and is called a voice grade channel. The other half-duplex mode is used for the terminal and is called a data grade

channel. The difference between a voice grade channel and a data grade channel is one of line quality, or line speed.

A voice grade channel is inferior in its quality of transmission compared to a data grade channel. The reason is one of economics: elements of human speech can be lost with the intelligence of the message still intact. This is possible because the human mind fills in the missing parts of speech not being received in a message text. It is unnecessary, and more cost effective, for a voice grade line to transmit a higher quality of message text than is needed for the message to be understood.

Data grade channels are a different story: if one character of a message text is lost in transmission then the entire message is either lost, or transmitted again, depending upon the method of transmission used. This is particularly true of data processing computers. In some communication terminals one character may be substituted for another. This results in a garbled text; but because the total message count remains constant the message is received as a copy of the message sent. There are, in fact, five different levels of data grade channels

that yield different levels of message interity. This, coupled with other methods of line quality and transmission methods, makes it possible to select the grade that best fits a users need and budget. As a general rule data processing messages have a higher level of message integrity than some communication terminals while voice grade messages have the lowest. This should hold true to your general experience: your terminal will seldom, if ever, display a garbled text, such as "incorrect format...." and "illegal address....".

As mentioned earlier CIO uses two, two wire, half-duplex modes to link the teleconference network and data terminals. These two wire modes are switched on a scheduled or as needed basis every day. A leased line is called a dedicated circuit. When you make a phone call from your home you use a two wire , half duplex switched line. As a general rule leased lines are four wire, full duplex, leased lines that are dedicated modes. This private leased line generally yields superior results for message transmission over switched, public lines. However, in Montana switched lines for CIO needs provide a good quality line.

LANGUAGE

Computers and terminals talk to each other in words, just as people talk to each other in words, and, as words are made up of individual elements known as vowels each computer word or character, is made up of individual elements called bits. Most often eight bits make up one character, though different languages utilize characters made up of five, six....to sixteen bits. For our purposes in this manual we will talk about characters constructed from eight bits.

A character is also called a byte: therefore, one can have an eight bit byte. The zero's and one's seen in the illustration above correspond to the amplitude (or level) of voltage transmitted in a digital format. (Please refer to Fig. 1, page ____) This is the electronic language that computers and terminals use to convey information.

A baud is a unit of signaling speed. Typically it is the speed at which one character can be transmitted: the higher the baud rate the faster the speed of transmission. Generally the bit rate and baud rate do not coincide directly but are close enough

that one can use the words "bits" (or "bits per-second") and "bauds" interchangeably and be understood by data communication people. Remember, a bit is a element of information while a baud is a unit of signaling speed.

Protocol is a method for managing data links. Protocol is the manner that one terminal speaks to another terminal. Without protocol messages would interfere with each other, detection of errors would not be possible and, in general, data telecommunications would not be possible.

This "handshaking" between terminals accomplishes the following, basic tasks:

Message available for transmission

Start of message transmission

Acknowledgement or rejection of message

Detection of errors in message count

Retransmission after error detection

End of message

Modems also employ line protocol (which is one rea-why there are so many lights that blink on and off)

more elaborate than shown in the above illustration, but which utilizes the same basic format. More on this in the Performance Orientation section of this manual.

Polling is the method that several terminals use to share the common link connecting them or the common data processing computer accessing several terminals. Typically, several terminals need wait only a few seconds to access another terminal or computer. When several terminals share the same data link in series multipoint polling is used. Each terminal waits for its "window" to either send or receive a message.

In point to point configurations each terminal can access a computer directly and independently of other terminals.

In Montana telecommunication networks employ both point to point and multipoint polling depending upon the type of computers and related terminal equipment in use, the type of tasks performed and the link configuration connecting the terminals to their computers.

GENERAL TROUBLE SHOOTING

When a particular piece of equipment fails, or when all office equipment fails, certain, general trouble shooting procedures can be most effective in returning your telecom equipment to line. the largest percentage of your office problems can be solved within five minutes. All that is necessary is to follow a trouble shooting procedure that will cover the common reasons for equipment failure. Such a general trouble shooting format can also be used to describe a problem in seeking help and in site documentation for future review and reports.

One of the most common causes for equipment failure is a loss of power. When you notice that some of your telecom equipment is down, check to see if any other pieces are also down: this will give you an indication of where the power failure occured. Example: if all the telecom equipment is down, but the office lights are still on, then the loss of power is most likely in the breaker (or fuse) panel supplying power to the telecom table. Check the breaker(s) (or fuse(s)) in the office panel.

If one particular piece of equipment is down check to see that its power cord is still connected to the power source supplying the telecom table. Often, due to cleaning or rearranging, power supplies will become disconnected.

If the particular piece of equipment still remains down check the fuse, generally on the back of the equipment. Following this check all other connections. One important procedure to remember is to physically manipulate all connections in question taking care to check the tightness of screws and other pressure type locking devices. Let your hands and eyes work as a single unit. If a connection is no longer intact refer to your Nomenclature, Function and Connection Guide (N.F.C. Guide) before making any corrections.

During power surges that are noticable (the flickering of lights) secure the office power (turn off) at the breaker panel supplying the office and wait five minutes or longer before powering up again, following the last surge. As most other offices will not power down during surges check with other offices in your building for an indication of when

the surges have stopped. Surges, or high voltage transients, can increase line voltage in your office up to five thousand plus volts. Needless to say this can damage office equipment, especially telecommunication equipment. If, however, your office is protected by surge suppression devices, now or in the future, this power down procedure will not be necessary. At present such surge protection is not in your terminals or printers or other office equipment.

The other extreme in voltage is known as the "brown out". Brown outs are decreases in power. Unless your office lights dim the most likely indication will be garbled messages and/or a slowing down in the printing rate of your printers or telecopy machine. This is also the most likely time that a fuse will be blown or a breaker, in your breaker panel or power supply source at the back of the telcom table, will be opened and power will be interrupted to your equipment. Fuses and breakers were designed to protect equipment against low voltage.

Fuses and breakers will not offer protection against

high voltage transients. If you know that you are experiencing a brown out in your office secure power at once. However, garbled meassages can result for reasons other than brown outs. For this reason it is best to have a line voltage monitor in your office.

If none of the above corrects the problem, or is not the cause of the problem, and a particular piece of equipment will not function then power up and power down by throwing the on-off switch. Wait five seconds between powering down and powering up. Often this will clear the send/receive portion of the terminal. This is especially true of the Beehive terminal.

In your general trouble shooting procedures, once the mechanical sources have been checked, you are left with procedural routines or operator error. The short end of the story is that you must make sure that you are using the correct modes to access the equipment. This is the heart of the Performance Orientation sections of the training manual and will be covered in detail beginning with the following.

CONFERENCE SET

Think of your teleconference set as an oversized telephone with multiple microphones: you will be one hundred percent correct. Without exterior modifications your teleconference set, or telcon set, can accept two external microphones, and with the built-in mike, provides three mikes for teleconferencing. As a general rule one or two mikes will meet most teleconferencing needs. When necessary the reserve built-in mike can be used, but because of its lesser transmission quality only the Information Officer should use this option.

When using microphones that have a push-to-talk option their specific on/off button of the telcon set can remain closed. This will reduce the cracking noise accompaning such switching and improve the overall quality of a teleconference as the push-to-talk buttons on individual mikes operate without noise.

If microphones are physically abused they will break. They are perhaps the weakest part in the entire teleconference system, so care must be exercised. Also the small, four wire, telephone type connection is

also fragile due to exposure to foot traffic and moving chairs about the teleconference table.

Often, just before a teleconference, one site will ask another how it sounds. Generally this is a microphone test for continuity, that is to check whether or not each particular mike is working and how well it sounds.

A standard, international RST code could be used in this instance to reduce suggestive responses. RST is a contraction for:

Readability	12345
Strength	123456789
Tone	123456789

As you can see from the above a numeric code follows each particular section of the RST code: a numeric value of one is the lowest while a numeric value of five (in the readability section) or nine is the highest, or optimum value. The best signal hoped for would be reported as "I copy you five, nine, nine."

Readibility simply means how well do you understand the information being received, that is you can hear every word spoken (a five) or you can hear only half of the words being spoken (a two). Strength relates

only to how strong the signal received is: a strong, clear signal is a nine; a signal of moderate strength could be a five while a strength just barely coming in would be a one. Tone is the most subjective of the three: a nine would report a full, rich human voice; a five would be a voice clipped in the higher or lower ranges of speech and/or 'tinny'. A voice received broken and with a great amount of background noise would be a two or one. This RST code is one that has stood the test of time in communications and takes only a little experience to become accustomed to and adapt for your own use.

MODEM LIGHT INDICATORS

When the technicians in either Helena or Missoula are trouble shooting data link system failure they may contact your office and ask you to read out the modem(s) as part of their diagnostic procedures. Often this will indicate if the data lines coming into your CIO have faulted or if the problem is in the office itself.

Modem controls located on the front panel of the LSI 2400:

AL -- Analog Loopback:	allows for testing of analog format. Test indicator will be on.
DL -- Digital Loopback:	allows for testing of digital format. Test indicator will be on.
TP -- Test Pattern:	allows for internal testing of the modem. Test indicator will be on.
CALL -- Technician call:	calls technician in either Helena or Missoula in Data Processing.

Modem indicators located on the front panel of the 2400:

RST -- Request to Send:	(green) indicates that data terminal connected to modem has information to send.
CTS -- Clear to Send:	(green) indicates that that modem is ready to accept information from data terminal for transmission.
TXD -- Transmit Data:	(green) indicates that information is being sent to another terminal and/or computer.
LSD -- Line Signal Detect:	(green) indicates that modem is receiving proper line levels from telecommunication links.
RXD -- Receive Data:	(green) indicates modem is receiving data from another terminal and/or computer.
TEST -- Test:	(yellow) indicates that modem is in test mode.

ERROR -- Error:	(red) indicates a receiver error during internal (TP) test only.
RATE -- Rate:	(yellow) indicates that modem is working at 1200 bps instead of 2400 bps.
POWER -- Power:	(green) indicates that power in modem is switched on.
MSG -- Message:	(yellow) indicates that technician in either Helena or Missoula has a message for you.

Modem controls located on back of LSI 2400:

POWER ON/OFF -- Power on/off switch: switches AC power to modem on or off.

FUSE -- Fuse: fuse holder for 120 Volt AC Slow-Blo 0.5 amp. fuse. Replace with same when necessary.

TELECOPIER

Your telecopier is a facsimile transceiver that can either send or receive a copy, on a one to one scale, of any document not thicker than a computer card. The telecopier 200 can work with a variety of other telecopiers on the market that have the same specifications, the most common of which for this Division, is the Xerox 200 telecopier.

A facsimile telecopier reads the degree of grayness in a document, or picture, being transmitted: the darker the image rotating past and electric eye the stronger the impulse then "burns off" a white covering on the page receiving the document. (Take a piece of telecopier paper, white side up, and scratch it with your finger; the harder you scratch the darker the image).

Your telecopier uses a standard telephone handset to make an acoustic coupling. This acoustic coupling modulates an analog signal (standard telephone or teleconference transmission signal) into an electrical impluse when receiving or the reverse (electrical impulse to analog format) when transmitting. As

noted above the handset can either be connected to the teleconference network or your office telephone.

The paper is loaded by lifting the drum door and aligning one edge of the paper in a metal locking device running the length of the drum. Rotate the drum at either end with your thumb: do not push on the metal drum itself. The paper is secured by closing the drum door. This procedure is the same for receiving or transmitting: in receiving the white side of the paper is face up and in sending the printed side is also face up. It is important that the paper not fold over itself on the drum or that images on the down side not show through, or else they too will be transmitted.

Check to make sure the telecopier is in either the send or receive mode and that the speed switch is in four or six. (A speed switch of four, the most common, means that the total time for a standard size paper to be copied or transmitted will be four minutes. A speed switch of six corresponds to a six minute receive or transmit time. These extra two minutes will allow for a greater fidelity of copy received, as in the sending of pictures).

The carriage position control (silver rabbit ears) must be in the extreme right to begin receiving or transmitting. To move the carriage position control squeeze together the two poles. If a transmission is not being received (no markings on the white paper) or being received poorly (solid gray on the white paper) squeeze and hold the carriage position control: an end of message tone will be sent to the transmitting set and you can then talk to the operator sending copy. Excess line noise will make your copy gray: split copy will sometimes be received because the telecopier receiving is not in sync (that is not turning in unison with) the telecopier transmitting. To correct a sync default transmit again. If line noise is a problem you may have to wait until the noise level decreases or use another transmission mode (teleconference or telephone).

To activate your telecopier for transmitting or receiving simply insert the handset. To discontinue remove the handset. You can transmit to an automatic telecopier by direct dialing on your office telephone. If the automatic telecopier is in use a busy tone will be heard. If available for copying a intermittent monotone will be heard.

An automatic telecopier can also send you several pages of telecopy. You have twenty seconds to insert a new page before the automatic telecopier will fault. When feeding new pages remove the handset (an intermittent monotone will be heard) and reinsert for consecutive copies. When your telecopier has received the last page remove the handset.

TROUBLE REPORTING

Trouble reporting and trouble shooting, can be enhanced by following a general outline (Fig. 4). When such a guide is transmitted to a particular site, or originates from a particular site, and is completed as necessary, it is called 'Format Keying'. Entries are made into format only when an item is true or positive.

A trouble report format can be entered into your terminal memory and retrieved for routine, daily telecommunication equipment reports as well as used to document and follow through on particular problems. By filling in the appropriate blanks time is saved and a standardized format is obtained for documentation and reports at later times.

IBM TERMINAL AND PRINTER

Your IBM terminal offers several programs for CIO use at the present. Before you can use any program, access to the computer linked to your terminal must be gained.

The keyboard of your IBM terminal has:

One key functions
Two key functions

That is, for some commands you need depress only one key while, for other commands, you must depress two keys at the same time. Also, several keys have two or more functions that they can be selected for by depressing the 'ALT' (alternate) key to the immediate right of the space bar. The ALT key must remain depressed while you are depressing the second key to select its other (or alternate) function. This is true of all two key functions. (Alternate functions are shown on the front side of a key.)

To gain access to the data base enter a code word in the home position of a blank video display. Simply type in the code word and depress the ENTER key. Your program format will appear offering you access to this program.

For example, we will use a legislative program called 'Basis". This is a one key function. You can select from:

Bill Identification...

Sponsor...............

Committee Name........ House ? Senate ?

Awaiting Action.......?

Other one key functions include the above. In Bill Identification type in the bill number, such as HB22 or SB77, following its title on the display and depress the ENTER key. To view which bills are in a particular committee type in the correct spelling of the committee, or its abbreviation (see single page instruction sheet) and which chamber (House or Senate) the committee is in. (Enter an X over ? mark following chamber). Note -- when moving the cursor across or down the display use an arrow marked key, not the space bar. Finally, to view which bills are before the Governor simply type in an X over ? mark following its title and depress the ENTER key.

To have a display printed depress the key in the extreme bottom left marked with a graphic symbol of

Shift keys are marked with and the shift lock

key is located just above the left shift key also graphically marked with the symbol of a pad lock.

To clear the display of any programs is a two key function: simultaneously depress ALT and CURSR SEL (cursor select) in the upper left of the keyboard. This function is especially useful when you wish to leave long programs and search for other data. The only other way to begin a new search is to work page by page through a current program being displayed. This can be time consuming.

The area across the bottom of your display set off by a solid line informs you of the status of your terminal. In the extreme left of the terminal status area are three symbols: the number six tells you that the terminal is working; the letter A informs you of which mode (Division of Public Services uses only mode A) and the solid block means that the terminal is ready to work for you at your present location.

Just to the right of the above symbol are operator codes that inform you of incorrect entries, ask you to wait, tells you that the keyboard is locked or asks for additional information. Additional entries can

not be made until this section of the status area has been cleared. To clear operator codes depress the RESET (reset) key to the left of the space bar.

Many of the terminals were designed to be used in conjunction with other terminals that do not have the ability of your terminal. In this regards your terminal would be the master, or smart, terminal for other, less expensive models. Your terminal can control seven other terminals.

To the immediate right of the operator codes section line codes will appear when the terminal is down. Information appearing in the line code section results from system failure and not terminal failure. "Zorkes" followed by a number indicate what type of link failure is occuring. Zorkes in this area of the status report can not be cleared by your terminal. Often, when a link failure is indicated this information will be duplicated in the operator section of your terminal: depress RESET to clear.

When your printer is connected this information will appear on the right of your status line with two digits indicating which port the printer is connected to: shows your printer is connected to port number one. When the printer fails a slash will

appear between the two graphic blocks. Printer failures must be cleared at the printer.

The printer is straight forward: all of its functions have been preprogramed. To operate turn the printer on at the left front (red switch) and wait for a warm up and self test period lasting thirty seconds. To the immediate right of the on/off switch the READY and CU SIGNAL (controlling unit signal, that is your terminal) will be lit when the printer is on line. If your printer is not on line the most expedient method is to power down and power up either the printer and/or the terminal. This is especially true when the terminal status shows that the printer is not working. Paper feeding is easy and does not present problems. Consult your Equipment 'Operators Guide'.

From the office layout one person can effectively control a teleconference in progress, greet people walking into the CIO and respond, simply by turning in a chair, to the telecommunications table. Of course this office layout is fairly straight forward for a CIO in a single room: what then would be the best layout in a two or three room layout?

Combine, if possible, the telecommunications table and your office desk. Ideally, this arrangement should be close to the main office entrance. As the majority of your time will be spent either at your desk or the telcommunications table this allows the most cost effective arrangement.

This brings us to the telecommunications table it-self: commonly called the telcom table. The telcom table is organized around the telecopier (facsimile) as two lines, that is the standard telephone and the teleconference lines, are often used to telecopy messages. In the illustration the information/data terminal is at one end of the telcom table. This will allow two people access at the same time without being too close for working comfort. The printer can set to the rear of the table where paper feeding each printer will have less friction entering. Mo-

dems and interface units should be mounted beneath, or to the side of, the telcom table.

There are other considerations involved in the telcom table:

Each end of a single wire should be marked

Each separate piece of equipment should be marked

A block diagram showing equipment connections

Data lines separated by six inches from power lines

Power lines must not be coiled

The labeling of each line, and their relation to equipment shown in a block diagram, will make repair and equipment replacement easier and insure correct connections. To this end your Nomenclature, Function and Connection Guide will be of assistance when used with a wiring diagram.

It is also important to separate the power lines from data lines (all other lines not supplying power to the telcom table). Power lines have a magnetic field that can interfer with data transmission; however, for the relative low power levels (120 volts) encountered in CIO's a distance of six inches between data and power lines is ample. Power lines should not be coiled:

coiling of power lines (as if wrapped around a can or disk) will increase the magnetic field and interfer with data transmission. When power lines must be shortened they should be gathered from the center and folded back over each other for the amount to be shortened. This will cancel any magnetic field. Be sure to tie the shortened amount securely. Data lines should be shortened in the same manner.

APPENDIX D

DATA TELECOMMUNICATIONS GLOSSARY

GLOSSARY

1. Acoustic Coupling: Connection of analog signal via standard handset for transmission over switched or leased lines.

2. Amplitude: Term referring to strength or levels in electronics.

3. Analog: Continuously variable transmission of signals; varies in direction, amplitude and frequency.

4. Alternating Current: Electrical current that flows in one direction and then in another; varies in amplitude.

5. Baud: Unit of signalling speed in date transmissions.

6. Bird: Nickname for satellite.

7. Bits: A single unit of information. Several bits constitute a byte.

8. Breaker (Panel): A thermal fuse that opens (stops) the flow, of current when its maximum limit, measured in Amps, is exceeded.

9. Bridge: A port sharing electronic device: may also maintain proper signal levels.

10. Brown Outs: Periods of decreased voltage below normal levels.

11. Bytes: A binary character. Composed of bits.

12. CPU: Contraction of Computer Processing Unit or Central Processing Unit.

13. Channel: A transmission path in telecommunications; composed of a mode and grade. Also called a line or link.

14. Character: See bytes.

15. Closed: A circuit in which electrons (current) flows.

16. Communications Terminal: A terminal sharing information with another terminal not processed by a data program.

17. Computers: Common term for second generation of computers. Accepts, manipulates and reports data, or information, according to a program. Handles complex computations.

18. Cursor: Indicates where next character entry will be made on a video screen.

19. Cycles-per-second: See Frequency.

20. Demodulation: Limiting a signal to changes in amplitude only. (see modulation)

21. Digital: Transmission of signal that varies only in amplitude.

22. Direct current: Electrical current that varies any in amplitude.

23. Down link: Information transmitted from a satellite.

24. Duplex: Allows for simultaneously transmissions and reception of a signal.

25. Facsimile: Electronic duplication, on a one to one basis, of transmitted information.

26. Format Keying: Completing a transmitted form that seeks information from the terminal to which addressed.

27. Frequency: The number of cycles-per-second of alternating current passing a single reference point.

28. Grade: The quality of transmission levels in a signal.

29. Half-duplex: Allows for transmission or reception of a signal.

30. Hardware: The physical equipment that composes a telecommunications network; that is, computers, terminals, modems, printers, etc..

31. Hertz: The name given to cycles-per-second in transmitted electromagnetic signals; named after German scientist who discovered frequency properties.

Glossary cont.

32. Information Terminal: Data communications equipment accessing (having input and output) to a CPU.

33. Interface: Provides for stabilization of signals in telecommunication links; maintains line levels.

34. Land Line: Nickname for standard telephone lines. Also called twisted pair.

35. Leased Line: A private line. A telecommunications line permanently closed between specific points on a continuous basis. Does not go through a switchboard.

36. Microcomputers: First generation of computers: handles routine computations of limited scope.

37. Microprocessor: See Microcomputers.

38. Microwave: A common term used for line of sight communications. Employs a super high frequency higher than commercial television transmissions.

39. Mode: Describes the type of path used to convey a signal: that is duplex, half-duplex, or simplex etc.

40. Modem: Contraction for modulation/demodulation. Data telecommunications equipment performing modulation/demodulation of transmitted signals.

41. Modulated: Alternation of a signal by amplitude, frequency or direction.

42. Noise: Unwanted signals on a channel.

43. Open Circuit: A circuit in which electrons (current) does not flow.

44. Polling: Sequential contact of several terminals in a network.

45. Port: Name for connection of input/output signals to computers and terminals.

46. Protocol: A procedure employed between computers and terminals for exchanging information.

47. Simplex: One way transmission of a signal; either receives or transmits only.

48. Software: Name for computer programs.

49. Surges: See Transients.

50. Switched Line: A public line. A telecommunications line connected to another telecommunications line via a switchboard.

51. Telecommunications Links: See Channel.

52. Transients: Another name for short periods of high voltage surges in commercial power supplies.

53. Transponder: Retransmits information received without altering signal frequency or information content.

54. Up-Link: Information transmitted to a satellite.

55. Voltage: Electrical pressure causing electrons (current) to flow.

APPENDIX E

SAMPLE NOMENCLATURE, FUNCTION AND CONNECTION GUIDE FOR INFORMATION OFFICERS

ITEM-------MODEM - A CONTRACTION OF MODULATION AND DEMODULATION

FUNCTION---TRANSFERS LINE INFORMATION FROM AN ALTERNATING CURRENT AND ANALOG FORMAT INTO A TWO LEVEL DIRECT CURRENT FOR INFORMATION RECEIVED AND THE OPPOSITE FOR INFORMATION TRANSMITTED.

CONNECTIONS--(a) MODEM TO DESIGNATED FOUR LINE CIRCUIT VIA A STANDARD, FOUR WIRE TELEPHONE LINE

(b) MODEM TO VIDEO DESIGNATED TERMINAL VIA A SINGLE, FLAT OR ROUND MULTI-PIN CABLE

(c) MODEM TO 115 A.C. POWER OUTLET VIA A SINGLE, ROUND THREE WIRE POWER CORD

BRAND NAME---PARADYNE

MODEL NO.----LSI 24 OR LSI 48

SERIAL NO.---________________

STATE I.D.---________________

REFERENCE----INSTALLATION, OPERATION AND MAINTENANCE MANUAL FOR THE LSI 2400 HIGH SPEED MODEM - MAINTENANCE MANUAL FOR THE LSI 48 NOT AVAILABLE. (POWER REQUIREMENTS: 115 VOLTS A.C., 60 HZS, 0.5 AMPS)

ITEM----------INFORMATION PRINTER

FUNCTION------PRINT-OUT INFORMATION RECEIVED/TRANSMITTED FROM THE VIDEO INFORMATION TERMINAL

CONNECTIONS---(a) INFORMATION PRINTER TO VIDEO INFORMATION TERMINAL VIA A SINGLE, ROUND CABLE

(b) INFORMATION PRINTER TO 115 A.C. POWER OUTLET VIA A SINGLE, ROUND THREE WIRE POWER CORD

BRAND NAME----IBM

MODEL NO.-----3287-2

SERIAL NO.----____________________

STATE I.D.----____________________

REFERENCE-----OPERATOR'S GUIDE FOR MODEL 3287 PRINTER

(POWER REQUIREMENTS: 115 VOLTS A.C., 60 HZS, 1.8 AMPS)

ITEM----------VIDEO DATA/COMMUNICATION TERMINAL

FUNCTION------(a) RECEIVES PRINTED INFORMATION FROM COMPUTER PROCESSING UNITS AND DISPLAYS SUCH INFORMATION ON THE TERMINAL'S VIDEO SCREEN

(b) TRANSMITS PRINTED INFORMATION TO COMPUTER PROCESSING UNITS AND DISPLAYS SUCH TRANSMITTED INFORMATION ON THE VIDEO SCREEN

CONNECTIONS---(a) VIDEO INFORMATION TERMINAL TO PARADYNE LSI 48 MODEM VIA A SINGLE, ROUND MULTI-PIN CABLE

(b) VIDEO INFORMATION TERMINAL TO INFORMATION PRINTER VIA A SINGLE, ROUND CABLE

(c) VIDEO INFORMATION TERMINAL TO 115 A.C. POWER OUTLET VIA A SINGLE ROUND, THREE WIRE POWER CORD

KEYBOARD-----(a) SELECTS THE MODE IN WHICH INFORMATION IS RECEIVED

(b) ENTERS TYPED INFORMATION INTO THE VIDEO INFORMATION TERMINAL AND SELECTS SEVERAL TERMINAL FUNCTIONS

BRAND NAME---IBM

MODEL NO.----3276-4

SERIAL NO.---__________________

STATE I.D.---__________________

REFERENCE----OPERATOR'S GUIDE BY DALE GRIGGS, DEPUTY DIRECTOR
DIVISION OF DATA PROCESSING
DEPARTMENT OF ADMINISTRATION
DATED 25 JULY 79

(POWER REQUIREMENTS: 115 VOLTS A.C., HZS, 1.0 AMPS)

ITEM----------TELECOPIER

FUNCTION------(a) RECEIVES PRINTED INFORMATION AS FACSIMILE REPRODUCTION OF ORIGINAL DOCUMENT

(b) TRANSMITS PRINTED INFORMATION AS FACSIMILE REPRODUCTION OF ORIGINAL DOCUMENT

CONNECTIONS--(a) TELECOPIER TO STANDARD TELEPHONE LINE OR LEGISLATIVE TELECONFERENCE NETWORK VIA ACOUSTICAL COUPLING USING STANDARD TELEPHONE COMPANY HANDSET FOR BOTH TRANSMITTING AND RECEIVING

(b) TELECOPIER TO 115 A.C. POWER OUTLET VIA A SINGLE, ROUND THREE WIRE POWER CORD

BRAND NAME---XEROX

MODEL NO.----400

SERIAL NO.---_______________

STATE I.D.---_______________

REFERENCE----400 TELECOPIER OPERATOR'S MANUAL BY XEROX

(POWER REQUIREMENTS: 115 VOLTS A.C., 60 HZS, 0.5 AMPS)

APPENDIX F

A SAMPLE LISTING OF AVAILABLE DATA BASES

ABI/INFORM: The ABI/INFORM database is designed to meet the information needs of executives and covers all phases of business management and administration.

ADSEARCH: Indexes all advertisements of $\frac{1}{4}$ page size or larger appearing in 148 major U.S. consumer magazines.

AIM/ARM: Is a specialized index for locating materials on vocational and technical education as well as the related areas of manpower economics and development, employment, job training and vocational guidance.

AMERICA: HISTORY AND LIFE: Covering the full range of U.S. and Canadian history, area studies, and current affairs, is a comprehensive and current aid to bibliographic research.

APTIC: Covers the field of air pollution in the broadest sense, including the social, political, legal and administrative aspects of the field.

AQUACULTURE: Provides access to information on the growing of marine, brackish, and freshwater organisms.

AUQUALINE: Provides access to information on every aspect of water, waste water, and the aquatic environment. Coverage includes water resources development, and management, drinking water quality, water treatment, sewage systems, sludge disposal, groundwater polution, river management, tidal waters, quality monitoring, environmental protection.

ARTBIBLIOGRAPHIES MODERN: Contains references to all modern art and design literature in books, dissertations, exhibition catalogs, and some 300 periodicals.

ASFA: AQUATIC SCIENCES AND FISHERIES ABSTRACTS is a comprehensive database on life sciences of the seas and inland waters as well as related legal, political and social topics.

ACCOUNTANTS: Provides access to the literature related to accounting, auditing, taxation, data processing, investments, financial management, financial reporting and related legal information.

AGRICOLA: Covers worldwide journal and monographic literature and U.S. government reports on agriculture and related subjects.

APILIT: Covers worldwide refining literature, including petroleum refining, petro-chemicals, air and water conservation, transportation and storage and petroleum substitutes.

APIPAT: Contains citations to petroleum refining patents from the U.S. and eight other countries: Belgium, Canada, France, Germany, Great Britain, Holland, Japan and South Africa.

ASI: The American Statistics Index covers statistical publications of the U.S. government: periodicals, annuals, biennials, surveys, analytical reports, statistical compilations, continuing serials, and special publications.

BANKER: Covers all articles and news items appearing in the American Banker, which is published five times weekly.

BIOCODES: Is used to determine BIOSIS codes, and is helpful for determining terminology for any life science search.

BIOSIS/BIO7479/BIO6973: Covers the entire life sciences.

BHRA FLUID ENGINEERING: Provides indexing and abstracting of world-wide information on all aspects of fluid engineering, including theoretical research as well as the latest technology and applications.

BIOGRAPHY MASTER INDEX: Serves as a master index to biographical information found in more than 600 source publications, including English language general and geographical Who's Who type publication major biographical dictionaries, handbooks of authors, and biographical directories.

BOOK REVIEW INDEX: is a reference guide to locate the source of published reviews of books and periodical titles.

CHEMNAME: Contains a listing of chemical substances in a dictionary-type, nonbibliographic file.

CHEMSEARCH: Includes all new chemical substances cited in the latest six issues of Chemical Abstracts.

CHEMSIS: Is a dictionary, non-bibliographic file containing those chemical substances cited once during a Collective Index Period of Chemical Abstracts.

CHILD ABUSE AND NEGLECT: Contains over 10,000 records of three sorts: ongoing research project descriptions, bibliographic references, and service program listings.

CLAIMS/CHEM: Database contains over 265,000 U.S. chemical and chemically related patents issued from 1950 - 1970.

CLAIMS/CITATION: Is designed to answer the question of which patents cite another patent. Includes all patent numbers cited in U.S. patents from 1947 to 1979.

CLAIMS/CLASS: Is a classification code and title dictionary for all classes and selected subclasses of the U.S. Patent Classification System.

CLAIMS/U.S. PATENTS: Database contains all patents listed in the general, chemical, electrical, and mechanical sections of the Official Gazette of the U.S. Patent Office.

CLAIMS/U.S. PATENT ABSTRACTS: Contains citations and abstracts for all patents classified by the U.S. Patent Office in the areas of aeronautical engineering, agricultural engineering, chemical engineering, chemistry, civil engineering, electrical and electronics engineering, electomagnetic technology, mechanical engineering, nuclear science, and general science and technology.

CLAIMS/U.S. PATENTS ABSTRACTS WEEKLY: Includes the most current weekly update and records from the current month.

CLAIMS/UNITERM: Gives access to chemical and chemically related patents. It has the special feature of subject indexing for each chemical patent from a controlled vocabulary designed to facilitate retrieval of chemical structures and polymers.

COMPENDEX: Is the machine-readable version of The Engineering Index, which provides abstracted information from the world's significant engineering and technological literature.

COMPREHENSIVE DISSERTATION INDEX: Is a definitive subject, title and author guide to virtually every American dissertation accepted at an accredited institution since 1861, when academic doctoral degrees were first granted in the United States.

CONFERENCE PAPERS INDEX: Provides access to records of more than 100,000 scientific and technical papers presented at over 1,000 major regional, national, and international meetings each year.

CONGRESSIONAL RECORD ABSTRACTS: This database provides comprehensive abstracts covering each issue of the Congressional Record, the official journal of the proceedings of the U.S. Congress.

CRIS/USDA: The projects described in CRIS cover current research in agriculture and related sciences, sponsored or conducted by USDA research agencies, state agricultural experiment stations, state forestry schools, and other cooperating state institutions.

CAB/CAB72: A worldwide agricultural information service including areas of biology, economics, engineering, education, genetics, pest control, rural planning, and sociology, and taxonomy.

CAS77/CAS7276/CAS6771: Provides worldwide coverage of the chemical sciences literature from over 12,000 journals, patents from 26 countries, new books, conference proceedings, and government research reports.

CASSI: The Chemical Abstracts Source Index is a compilation of bibliographic and library holdings information for scientific and technical primary literature relevant to the chemical sciences.

CBPI: The Canadian Business Periodicals Index provides coverage of over 150 Canadian trade and business publications, including the Globe and Mail Report on Business, the Financial Post and the Financial Times.

CDI: Comprehensive Dissertation Index contains dissertations accepted for academic doctoral degrees granted by the U.S. and a number of non-U.S. educational institutions and universities. Subject coverage is multidisciplinary, and includes the humanities, social sciences, sciences, and engineering.

CHEMDEX/CHEMDEX2: These two chemical dictionaries are companion files to the Chemical Abstracts databases. All compounds cited in the literature from 1972 to date are contained in these files.

CHEMSDI: Covers information cited in the last six weeks of Chemical Abstracts. This file will contain detailed information about chemical compounds cited as well as the indexing parameters available in CAS77, CAS7276, and CAS6771.

CIN: Chemical Industry Notes contains citations to business literature in the chemical industry, including pharmaceutical, petroleum, paper and pulp, agriculture, and food industries.

CIS: Covers publications emanating from the work of committees and subcommittees of the U.S. Congress: hearings, committee prints, House and Senate Reports, Documents, and special publications; and Senate Executive Reports and Documents. Public Laws are added on an annual basis.

CNI: The Canadian Newspaper Index file covers 7 major Canadian newspapers. Subjects include international news, national news, provincial affairs, editorials, government activities, labor news, reviews, obituaries, and biographies.

COLD: Cold Regions database covers all disciplines dealing with Antarctica, the Antarctic Ocean, and subantarctic islands; snow, ice, and frozen ground; navigation on ice; civil engineering in cold regions, and behavior and operation of materials and equipment in cold temperatures.

COMPENDEX: Covers worldwide significant engineering literature from approximately 2,000 serials and over 900 monographic publications.

CRDS: Chemical Reactions Documentation Service, based on the monthly Journal of Synthetic Methods, provides up-to-date information on new developments in the field of synthetic organic chemistry.

CRECORD: Contains references to bills and resolutions, committee and subcommittee reports, legislation recently signed into law, schedules of committee and floor activities, executive communications, speeches, participation in debates, and inserted materials by members of Congress.

DBI: Database Index is the master index to all SDC Search Service databases. It is used as a selection tool to obtain a list of appropriate databases on a given subject.

DOANE: Corresponds to the Doane Information Center Undexing Service and covers the literature of agricultural practise, production, products and marketing.

DIALINDEX: Is a collection of file indexes for all Dialog databases. Dialindex provides the numbers of postings for each search statement in each of the databases specified. Dialindex thus indicates which file(s) would be most productive for a search statement, in addition to helping to determine how broadly or narrowly to define a search strategy statement.

DIALOG PUBLICATIONS: Is a special feature database which allows you to order Dialog publications, such as "The Guide to Dialog Searching", online.

DISCLOSURE: Provides extracts or reports filed with the U.S. Securities and Exchange Commission by publicly owned companies. These reports, filed by 11,000

companies, provide the most reliable and detailed source of public financial and administrative data on these companies.

DOE ENERGY: Includes reference journals, report literature, conference papers, books, patents, dissertations, and translations. All manner of energy topic are included.

ECONOMICS ABSTRACTS INTERNATIONAL: Provides coverage of the world's literature on markets, industries, country specific economic data, and research in the fields of economic science and management.

EIS INDUSTRIAL PLANTS: Access to the EIS Plants database offers immediate answers to a broad range of questions concerning the U.S. industrial economy.

EIS NONMANUFACTURING ESTABLISHMENTS: Provides such information as location, headquarters name, percent of industry sales, industry classification, employment size class, etc. for over 240,000 non-manufacturing establishments which employ 20 or more people.

ENCYCLOPEDIA OF ASSOCIATIONS: Provides detailed information on several thousand trade associations, professional societies, labor unions, fraternal and patriotic organizations, and other types of groups consisting of voluntary members.

ENVIRONMENTAL BIBLIOGRAPHY: Covers the field of general human ecology, atmospheric studies, energy, land resources, water resources, nutrition and health.

EXCEPTIONAL CHILD EDUCATIONAL RESOURCES: A comprehensional database concerned with published and unpublished literature on the education of handicapped and gifted children. Nore than 23,000 citations are included in the ECER database, covering such sources as books, journal articles, teaching materials and reports.

EXCERPTA MEDICA: Consists of abstracts and citations of articles from over 3,500 biomedical journals published throughout the world. It covers the entire field of medicine and related disciplines.

EBIB: Covers worldwide literature on energy from the Texas A&M Library collection. Subjects covered include but are not limited to, production, utilization, and conservation of all types of fuels.

EDB: The Energy Data Base provides comprehensive coverage of literature, patents, monographs, and technical reports concerning all aspects of energy production, utilization and conservation.

ELCOM: The Electronics & Communications database contains electronic physics, electronic systems, and applications, electric circuits, electronic devices, communications, computer software, computer applications, computer mathematics, and computer electronics from international sources.

ENERGYLINE: Over 2,000 journals, as well as reports, surveys, monographs, conference proceedings, and irregular serials, are screened to provide comprehensive coverage of energy information.

ENVIROLINE: Provides coverage of air environment environmental health, land environment, resource management, and water environment.

EPIA: Electric Power Industry Abstracts provides access to literature on electric power plants and related facilities.

ERIC: Covers report and periodical literature in education-related areas: counseling and personnel services, career education, early childhood education, educational management, exceptional children, information resources, languages, and linguistics, reading and communications, rural education, tests, measurement, and evaluation, and teacher education.

FEDEX: The Federal Index contains information on federal government activities from the Congressional Record, the Federal Register, the Weekly Compilation of Presidential Documents and the Washington Post.

FEDREG: The Federal Register includes rules, proposed rules, public law notices, meeting, hearings, and Presidential proclamations on subjects including agriculture, arts, and humanities, athletics, business, constitutional rights, consumer affairs, contracts, defense, environment, foriegn affairs, law enforcement, parks/recreation, taxation, technology, trade, transportation and veterans' affairs.

FOREST: Forest Products covers worldwide literature pertinent to the entire wood products industry, from harvesting to standing tree through marketing of the final product.

FSTA: Covers the entire field of food science and technology. Covers the literature related to all human food commodities and aspects of food processing.

FOODS ADLIBRA: Contains up-to-date information on the latest developments in food technology and packaging. All new food products introduced since 1974 are covered, and nutritional and toxicology information is also included.

FOREIGN TRADE INDEX: Designed to provide information to U.S. businesses or manufacturers by listing these firms which either import goods from the United States or state that they are interested in representing U.S. exporters.

FOUNDATION DIRECTORY: Provides descriptions of over 3500 foundations which have assets of $1 million or more or which make grants of $100,000 or more annually.

FOUNDATION GRANTS INDEX: Contains information on grants awarded by more than 400 major American philanthropic foundations, representing all records from the Foundation Grants Index section of the bi-monthly Foundation News.

FROST AND SULLIVAN DM: The DM database provides access to announcements about U.S. Government contract awards request-for-proposals, R&D sources sought, sole-source negotiations, long range planning estimates, and advanced planning procurement information for the engineered services and systems market.

GEOARCHIVE: A comprehensive geoscience database indexing more than 100,000 references each year. Information indexed annually for Geoarchive includes more than 5,000 serials, books from more than 1,000 publishers, several hundred conferences, doctoral dissertations, and technical reports.

GRANTS DATABASE: The source to more than 1500 grant programs available through government, commercial organizations, associations and private foundations.

GEOREF: The Geological Reference database covers geosciences literature from over 3,000 journals, plus books, conference proceedings, government documents, maps and theses.

GPO: The Government Printing Office file covers publications of U.S. government agencies and the U.S. Congress. Senate and House hearings on bills and laws, as well as fact sheets, maps, agency-supported studies, handbooks, bibliographies, and conference proceedings are included.

GRANTS: A complete source containing references to grant programs offered by federal, state and local government, commercial organizations, and private foundations in over 88 disciplines.

HISTORICAL ABSTRACTS: A reference service that abstracts and indexes the world's periodical literature in history and the related social sciences and humanities.

INPADOC: Provides references to approximately 16,000 patents per week from 45 countries.

INTERNATIONAL PHARMACEUTICAL ABSTRACTS: Provides information on all phases of the development and use of drugs and on professional pharmaceutical practice.

IRL LIFE SCIENCES COLLECTION: Contains abstracts of information in the fields of animal behavior, biochemistry, ecology, entomology, genetics, immunology, microbiology, toxicology, and virology among others, and corresponds to the series of 15 abstracting IRL journals.

ISMEC: Indexes significant articles in all aspects of mechanical engineering, production engineering, and engineering management from approximately 250 journals published throughout the world.

INFORM: Covers about 500 periodicals in the areas of business, management and industry.

INSPEC/INSP6976: Provides worldwide coverage of the literature in physics, electrical/electronics engineering,and computers and control.

LABORDOC: Covers worldwide journal and monographic literature in the fields of labor and labor-related areas, including industrial relations, economic and social development, managment, demography, education, law, environment, and earth sciences.

LIBCON: Provides extensive coverage of the monographic literature, serials, maps, manuscripts, and other materials cataloged by the U.S. Library of

Congress as well as Conser and National Library of Canada publications.

LISA: Provides worldwide coverage of the field of library and information science, including library history, comparative librainship, users and users' behavior, library automation, information storage, and retrieval, buildings, and equipment.

LABOR STATISTICS: Database is based on summary data generated by Bureau of Labor Statistics survey.

LANGUAGE AND LANGUAGE BEHAVIOR ABSTRACTS: Provides current selective access to the world's literature on language and language behavior as a service to all researchers and practitioners in disciplines concerned with the nature and use of language.

LEGAL RESOURCE INDEX: Provides cover-to-cover indexing of over 660 key law journals and 5 law newspapers plus legal monographs and government publications from the Library of Congress MARC database.

MAGAZINE INDEX: Covers over 370 popular magazines and provides extensive coverage of current affairs, leisure time activities, home centered arts, sports, recreation and travel, the performing arts, business, science and technology, consumer product evaluations, and other areas.

MANAGEMENT CONTENTS: Database provides current information on a variety of business and management related topics to aid individuals in business, consulting firms, educational institutions, government agencies or bureaus, and libraries in decision making and forecasting.

MEDLINE: Corresponds to three printed indexes: Index Médicus, Index to Dental Literature, and International Nursing Index. Medline covers virtually every subject in the broad field of biomedicine.

MENTAL HEALTH ABSTRACTS: Database cites worldwide information relating to the general topic area of mental health. Sources include 12,000 journals, books, monographs, technical reports, workshop and conference proceedings, and symposia.

METADEX (METALS ABSTRACTS/ALLOYS INDEX): Metals Abstracts include about 30,000 citations each year from about 1,100 primary journal sources. Alloys index supplements Metal Abstracts by providing access to the citations through commercial, numerical, and compositional alloy designations; specific metallic systems; and intermetallic compounds found within these systems.

METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS: Provides current citations in English for the most important meteorological and geoastrophysical reasearch published in worldwide literature sources. Over 200 sources, including technical journals, monographs, proceedings, reviews, and annual publications are scanned for relevant literature.

MLA BIBLIOGRAPHY: Indexes books and journal articles published on modern languages, literature and linguistics.

MANAGEMENT: Provides extensive coverage of the business and managment literature from both U.S. and non-U.S. journals, proceedings, and transactions.

MONITOR: Contains all articles and many regular columns that appear in all of the regional editions of the Christian Science Monitor.

NDEX: Is unequaled in its broad coverage of international, national, state and local news providing regional as well as national perspectives on major events, issues, personalities, etc. Ten major U.S. newspapers and eleven Black newspapers are covered.

NTIS/NTIS6469: Covers U.S. government-sponsored research and development from over 200 federal agencies. Includes technical reports, some reprints, federally sponsored translations, and foreign-language reports in areas of major technical interest.

NATIONAL FOUNDATIONS: Provides records of all 21,800 United States foundations which award grants regardless of the assets of the foundation or of the total amounts of grants it awards annually.

NATIONAL NEWSPAPER INDEX: Provides front page to back page indexing of The Christian Science Monitor, The New York Times, and The Wall Street Journal. All articles, news reports, editorials, letters to the editor, obituaries, product evaluations, biographical pieces, poetry, recipes, columns, cartoons and illustrations, and reviews are included.

NCJRS: Covers all aspects of law enforcement and criminal justice from police; courts; corrections; juvenile justice, community crime prevention; criminal justice system; fraud, waste, and abuse in government programs.

NEWSEARCH: A daily index of more than 2000 news stories, information articles and book reviews from over 1400 of the most important newspapers, magazines and periodicals.

NICEM: Database offers comprehensive coverage of non-print educational material. Nicem covers the entire spectrum of the educational field from pre-school to professional and graduate school levels.

NICSEM/NIMIS: National Instructional Materials Information System contains descriptions of media and devices for use with handicapped children.

NONFERROUS METALS ABSTRACTS: Covers all aspects of nonferrous metallurgy and technology. Sources include journals, monographs, British patents, reports, standards and conference papers.

OCEANIC ABSTRACTS: Organizes and indexes technical literature published worldwide on marine-related subjects. Over 9,000 citations from approximately 2,000 domestic and foreign sources are added to the database each year.

ONTAP CA SEARCH: To provide a low cost database containing chemical information which may be used to demonstrate Dialog chemical information system to people unfamiliar with the Dialog service.

ONTAP CHEMNAME: Chemical substance information may be retrieved in Ontap Chemname by use of the molecular formula, systematic nomenclature or synonyms, and other chemical data.

ONTAP ERIC: A programmed instruction file designed to provide an opportunity for low-cost training and practice in online searching. Ontap Eric allows the user to choose a practice search topic from 29 different questions ranging in complexity from simple to difficult.

ORBIT: Once connected to the Orbit database, the user may request online explanations, display the system news, order copies of full-text documents from any of the available services, send requests for information or documentation to the Action Desk, and perform other maintenance or housekeeping functions.

PAPERCHEM: Covers the scientific and technical literature of the pulp, paper, and board manufacturing and utilizing industries from all industrialized countries.

P/E NEWS: The Petroleum/Energy Business News Index covers twelve major publications: Energy Asia, Platts Oilgram News Service, Middle East Economic Survey, National Petroleum News, Petroleum Intelligence Weekly, Petroleum Economist, Oil Daily, Oil Gas Journal, Lundberg Letter, Petroleum Times, Oil & Energy Trends, and Petroleum News Southeast Asia.

PESTDOC/PESTDOC II: Covers worldwide literature on pesticides, herbicides, and plant protection designed specifically for the information requirements of agricultural chemical manufacturers exclusive of fertilizers.

PIE: The Pacific Islands Ecosystems database contains biological, ecological, physical and socio-economic information on the Pacific Islands.

PROMT/PREDALERT: Contains industry-specific information, including historical and projected data and reports on the state of the technology, marketing climate, consumer patterns, and the economy throughout the world.

PSYCHABS: Provides international coverage of psychology and other behavioral sciences.

PAIS INTERNATIONAL: Contains references to information in all fields of social science including political science, banking, public administation, international relations, economics, law, public policy, social welfare, sociology, education and social anthropology.

PHARMACEUTICAL NEWS INDEX: The online source of current news about pharmaceuticals, cosmetics, medical devices, and related health fields.

PHILOSOPHER'S INDEX: Provides indexing and abstracts from books and over 270 journals of philosophy and related interdisciplinary fields.

PIRA: Database is indexed and abstracted from literature published throughout the world including over 600 periodicals as well as books, pamphlets, standards, specifications, legislation, translations, conference papers, research reports, trade literature, and other information.

POLLUTION ABSTRACTS: Is a leading resource for references to environmentally related literature on pollution, its sources and its control.

POPULATION BIBLIOGRAPHY: A principal source for information on abortion, demography, migration, family planning, fertility studies, and all general areas of population research methodology.

PSYCINFO: Covers the world's literature in psychology and related disciplines in the behavioral sciences.

PTS F&S INDEXES: Covers both domestic and international company, product, and industry information. It contains information on corporate acquisitions and mergers, new products, technological developments, and sociopolitical factors.

PTS INTERNATIONAL FORECASTS: Contains abstracts of published forecasts with historical data for all countries of the world. Coverage includes general economics, all industries, detailed products, and end-use data.

PTS INTERNATIONAL STATISTICS: (See PTS International Time Series and PTS International Forecasts)

PTS INTERNATIONAL TIME SERIES: Composed of two subfiles:
Worldcasts Composites: Contains about 2,500 forecast time series consisting of about 50 key series for each of the 50 major countries of the world.
Worldcasts Basebook: Contains annual data from 1957 to date for about 125,000 series for all countries of the world.

PTS PREDALERT: Approximately 8,000 records are added on a weekly basis to provide users with access to the most current Predicasts data before it is transferred to the monthly cumulative databases.

PTS PROMT: Abstracts all significant information appearing in thousands of newspapers, business magazines, government reports, trade journals, bank letters, and special reports throughout the world.

PTS U.S. TIME SERIES: Composed of two subfiles: Predicasts Composites. Contains 500 time series on the U.S. giving historical data (since 1957) and projected consensus of published forecasts through 1990.
Predicast Basebook: Contains annual data from 1957 to date for about 30,000 series on U.S. production consumption, prices, foreign trade, agriculture, mining, manufacturing, wages and end-use distribution for many types of industries, products and services.

PTS U.S. FORECASTS: Contains abstracts of published forecasts for the United States from trade journals, business and financial publications, key newspapers, government reports, and special studies.

QUEBEC: This French-language database contains citations and abstracts from three Quebec newpapers: Le Devoir, La Presse, and Le Soleil.

RANGE: Covers published literature on range and pasture management in the U.S. and Canada.

RINGDOC/RING6475: Covers worldwide pharmaceutical literature, specifically designed to meet the in-

formation needs of pharmaceutical manufacturers.

RAPRA ABSTRACTS: A comprehensive database covering the commercial, technical, and research aspects of the rubber and plastics industries.

RILM ABSTRACTS: An international database containing abstracts of all significant literature on music.

SCISEARCH: A multidisciplinary index to the literature of science and technology prepared by the Institute for Scientific Information.

SELECTED WATER RESOURCES ABSTRACTS: File covers a wide range of water resource topics including water resource economics, ground and surface water hydrology, metropolitan water resources planning and management, and water-related aspects of nuclear radiation and safety.

SOCIAL SCISEARCH: A multidisciplinary database indexing every significant item from the 1,000 most important social sciences journals throughout the world and social sciences articles selected from 2,200 additional journals in the natural, physical, and biomedical sciences.

SPECIAL EDUCATION MATERIALS: Database provides comprehensive coverage of print and non-print educational materials of relevance to educators, parents, in-service trainers, assessment specialists, and others concerned with education, care and management of handicapped learners.

SPIN: Is designed to provide the most current indexing and abstracting of a selected set of the world's most significant physics journals.

STANDARD & POOR'S NEWS: Offers information on more than 9000 U.S. companies covering interim earnings, management changes, contract awards, mergers, acquisitions, bond descriptions, and corporate background, including subsidiaries, litigation and officers.

SURFACE COATINGS ABSTRACTS: Contains references to research literature on all aspects of paints and surface coatings including pigments, dyestuffs, resins, solvents, plasticisers, printing inks, insulations, fire retardants, occurrence and prevention of deterioration, testing, industrial hazards, pollution and marketing.

SAE: Provides access to technical papers presented at Society of Automotive Engineers meetings and conferences.

SAFETY: Provides broad, interdisciplinary coverage of literature related to the science of safety, a relatively new field devoted to identifying, evaluating, and eliminating or controlling hazards.

SPORT: Provides unique, extensive coverage of individual sports, including practice, training and equipment, recreation, sports medicine, physical education, sport facilities, and international sports history.

SSCI: The Social Science Citation Index provides extensive coverage of the journal literature and cited references in the social sciences.

SSIE: Covers current research in progress for both basic and applied research from over 1,300 organizations, including federal, state and local government; nonprofit associations; colleges and universities; individual investigators; and some non-U.S. organizations and private industry.

SWRA: Selected Water Resources Abstracts covers published literature on all aspects of water resources, including water-related aspects of life, physical, and social sciences, as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water.

TITUS: Provides comprehensive information related to the textile industry, designed specifically for textile managers, engineers, and technicians.

TROPAG: Covers worldwide literature on tropical and subtropical agriculture, including crop production, crop protection, fertilizers, and soils, plant nutrition, agricultural techniques, crop processing, and storage, sociology, economics, commercial, and statistical information.

TSCA: This is a chemical dictionary file, listing nomenclature, molecular formulae, Registry Numbers, and EPA indentification numbers.

TULSA: Covers worldwide literature and patents re-

lated to oil and natural gas exploration, development, and production.

TRADE OPPORTUNITIES: Provides leads to export opportunities for U.S. businesses; the information is supplied by Foreign Service officers directly to the U.S. Department of Commerce.

TRADE OPPORTUNITIES WEEKLY: Includes current records added on a weekly basis and transferred to Trade Opportunities, File 106 on a quarterly basis.

TRIS: Provides transportation information in air, highway, rail, and maritime transport; mass transit; and other transportation modes.

TSCA INITIAL INVENTORY: A non-bibliographic dictionary listing chemical substances in commercial use in the U.S. as of June 1, 1979.

U.S. EXPORTS: Gives export statistics that reflect both government and non-government exports of domestic and foreign merchandise from the U.S. and Territories to foreign countries.

USCA: U.S. Contracts Awards provides access to more than 39,000 contracts awarded by the federal government and its agencies to both public and private sectors.

USCLASS: Contains all U.S. Classifications, Cross-Reference Classifications, and Unofficial Classifications for all patents issued from the start of the U.S. Patent Law, 1860, to date.

USPO/USPA: The U.S. Patent Office files cover all U.S. patents, continuations, divisionals, and defensive documents from 1971 to date. These files provide access to all information listed on the front page of a U.S. patent plus all Claims, as well as additional data elements.

USPSD: United States Political Science Documents provides cover-to-cover analysis of 150 major U.S. political science journals.

USRFP1/USRFP2/USRFP3: U.S. Requests for Proposals contains announcements and summaries of Federal Requests for Proposals in research and development, consulting, training, computer services, engineering, evaluation, and other professional service areas.

VETDOC: Covers worldwide journal literature on veterinary applications of drugs, hormones, vaccines, growth promotants, etc., for use in domestic and farm animals.

VOTES: Covers the complete record of roll call voting by members of the U.S. Congress. Contains bills, resolutions, joint resolutions, concurrent resolutions, executive treaties, nominations, and other legislative action taken to a roll call vote.

WATERLIT: Covers worldwide water resources literature collected by the South African Water Information Centre.

WPI/WPIL: The World Patents Index is a comprehensive and authoritative file of data relating

to patent specifications issued by the Patent Offices of 24 major industrial countries, plus EP and PCT patents, and Research Disclosure.

WELDASEARCH: Database provides primary coverage of the international literature on all aspects of the joining of metals and plastics and related areas such as metals spraying and thermal cutting.

WORLD ALUMINUM ABSTRACTS: Provides coverage of the world's technical literature on aluminum, ranging from ore processing through end uses.

WORLD TEXTILES: The machine-readable version of World Textiles Abstracts and indexes world literature on the science and technology of textile and related materials; on the technical economics, production, and management of the textile industry; and on the consumption of and international trade in textile materials and products.

APPENDIX G

THE SOCIAL FRAMEWORK OF THE INFORMATION SOCIETY

by DANIEL BELL, THE MIT PRESS; 1980

9
The Social Framework of the Information Society

Daniel Bell

The endless cycle of idea and action,
Endless invention, endless experiment,
Brings knowledge of motion, but not of stillness. . . .
Where is the Life we have lost in living?
Where is the wisdom we have lost in knowledge?
Where is the knowledge we have lost in information?

T. S. Eliot: Choruses from "The Rock"

INFORMATION AND TELECOMMUNICATIONS IN THE POSTINDUSTRIAL SOCIETY

In the coming century, the emergence of a new social framework based on telecommunications may be decisive for the way in which economic and social exchanges are conducted, the way knowledge is created and retrieved, and the character of the occupations and work in which men engage. This revolution in the organization and processing of information and knowledge, in which the computer plays a central role, has as its context the development of what I have called the postindustrial society.[1] Three dimensions of the postindustrial society are relevant to the discussion of telecommunications:

a. The change from a goods-producing to a service society
b. The centrality of the codification of theoretical knowledge for innovation in technology
c. The creation of a new "intellectual technology" as a key tool of systems analysis and decision theory

The change from a goods-producing to a service society can be indicated briefly. In the United States in 1970, sixty-five out of every 100

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persons in the labor force were engaged in services, about 30 percent in the production of goods and construction and under 5 percent in agriculture. The word *services* of course covers a large multitude of activities. In preindustrial societies a sizable proportion of the labor force is engaged in household or domestic service. (In England until the 1870s the single largest occupational class was servants.) In an industrial society services are auxiliary to the production of goods, such as transportation (rail and truck), utilities (power and light), banking, and factoring. Postindustrial services are of a different kind. They are human services and professional services. The human services are teaching, health, and the large array of social services; professional services are those of systems analysis and design and the programming and processing of information. In the last two decades, the net new growth in employment has been entirely in the area of postindustrial services, and while the rate of growth has slowed (particularly because of the financial costs of education and the cutbacks in social services in urban communities), the general trend continues.

The axial principle of the postindustrial society, however, is the centrality of theoretical knowledge and its new role, when codified, as the director of social change. Every society has functioned on the basis of knowledge, but only in the last half century have we seen a fusion of science and engineering that has begun to transform the character of technology itself. As Cyril Stanley Smith, the distinguished metallurgist, has observed, "In only a small part of history has industry been helped by science. The development of a suitable science began when chemists put into rational order facts that had been discovered long before by people who enjoyed empirical diverse experiment."[2]

The industries that still dominate society—steel, auto, electricity, telephone, aviation—are all "nineteenth-century" industries (though steel began in the eighteenth century with the coking process of Abraham Darby, and aviation in the twentieth with the Wright Brothers) in that they were created by "talented tinkerers" who worked independently of or were ignorant of contemporary science. Alexander Graham Bell, who invented the telephone about one hundred years ago (though the actual fact is in some dispute), was an elocution teacher who was looking for some means to amplify sound in order to help the deaf. Bessemer, who created the open-hearth process (to win a prize offered by Napoleon III for a better means of casting cannon) did not know the scientific work of Henry Clifton Sorby on metallurgical processes. And Thomas Alva Edison, who was probably the most prolific and talented of these tinkerers (he invented, among other things, the electric light bulb, the phonograph, and the motion picture), was a mathematical illiterate who knew little and cared less about the theoretical equations of Clerk-Maxwell on electromagnetic properties.

Nineteenth-century inventing was trial-and-error empiricism, often guided by brilliant intuitions. But the nature of advanced technology is its intimate relation with science, where the primary interest is not in the product itself but in the diverse properties of materials together with the underlying principles of order that allow for combination, substitution, or transmutation. According to Cyril Smith, "All materials came to be seen in competition, with the emphasis only on the properties that were needed. Thereafter every new development in advanced technology—radar, nuclear reactors, jet aircraft, computers and satellite communications to name a few—has served to break the earlier close association of materials research with a single type of manufacture, and the modern materials engineer has emerged."

The nature of this change, in technology and in science, has been to enlarge the "field of relation" and the range of theory so as to permit a systematic synergism in the discovery and extension of new products and theories. A science, at bottom, is a set of axioms linked topologically to form a unified scheme. But as Bronowski has observed, "A new theory changes the system of axioms and sets up new connections at the joints which changes the topology. And when two sciences are linked to form one (electricity and magnetism, for instance, or evolution with genetics), the new network is richer in its articulation than the sum of its two parts."[3]

While modern science, like almost all human activities, has moved toward a greater degree of specialization in its pursuit of more detailed knowledge, the more important and crucial outcome of its association with technology is the integration of diverse fields or observations into single conceptual and theoretical frameworks offering much greater explanatory power. Norbert Wiener, in his autobiographical *I Am a Mathematician*, points out that his first mathematical papers were on Brownian motion and that at the same time electrical engineering work was being done on the so-called shot effects, or the movement of electric current through a wire. The two topics were unrelated, yet twenty years later the situation had changed dramatically

> In 1920 very little electrical apparatus was loaded to the point at which the shot effect became critical. However the later development—first of broadcasting and then of radar and television—brought the shot effect to the point where it became the immediate concern of every communications engineer. The shot effect was not only similar in origin to the Brownian movement, for it was a result of the discreteness of the universe, but had essentially the same mathematical theory. Thus, my work on the Brownian motion became some twenty years later a vital tool for the electrical engineer.[4]

Wiener's theory of cybernetics joins a variety of fields in the common framework of statistical information theory. "The development of ideas on the structure of synthetic polymers," Cyril Smith writes, "eventually came

to bridge the gap between the nineteenth century chemist's molecule and the early twentieth-century crystal, so paving the way for the unified structural view of all materials which we see taking shape today."[5] The development of solid-state physics, which is the foundation of the electronic revolution, arose out of the work of metallurgists and physicists on the structure of conductor devices.

The methodological promise of the second half of the twentieth century is the management of organized complexity: the complexity of theories with a large number of variables and the complexity of large organizations and systems which involve the coordination of hundreds of thousands and even millions of persons. Since 1940 there has been a remarkable efflorescence of new fields and methods whose concern is with the problems of organized complexity: information theory, cybernetics, decision theory, game theory, utility theory, stochastic processes. From these have come specific techniques such as linear programming, statistical decision theory, Markov chain applications, Monte Carlo randomizing, and minimax strategies, which allow for sampling from large numbers, alternative optimal outcomes of different choices, or definitions of rational action under conditions of uncertainty.

Since technology is the instrumental mode of rational action, I have called this new development "intellectual technology," for these methods seek to substitute an algorithm (i.e., decision rules) for intuitive judgments. These algorithms may be embodied in an automatic machine or a computer program, or a set of instructions based on some statistical or mathematical formula, and represent a "formalization" of judgments and their routine application to many varied situations. To the extent that intellectual technology is becoming predominant in the management of organizations and enterprises, one can say that it is as central a feature of postindustrial society as machine technology is in industrial society.

A Knowledge Theory of Value

If one compares the formal properties of postindustrial society with those of industrial and preindustrial society (see table 9.1), the crucial variables of the postindustrial society are information and knowledge.

Table 9.1
The Postindustrial Society: A Comparative Schema

	Preindustrial	Industrial	Postindustrial
Mode of Production	Extractive	Fabrication	Processing; Recycling
Economic sector	Primary Agriculture Mining Fishing Timber Oil and gas	**Secondary** Goods-producing Manufacturing Durables Nondurables Heavy construction	Services **Tertiary** Transportation Utilities **Quinary** Health, education Research, government, Recreation **Quarternary** Trade Finance Insurance Real estate
Transforming resource	**Natural power** Wind, water, draft animal, human muscle	**Created energy** Electricity—oil, gas, coal, nuclear power	**Information** Computer and data-transmission systems
Strategic resource	Raw materials	Financial capital	Knowledge
Technology	Craft	Machine technology	Intellectual technology
Skill base	Artisan, manual worker, farmer	Engineer, semiskilled worker	Scientist, technical and professional occupations
Methodology	Commonsense, trial and error; experience	Empiricism, experimentation	Abstract theory, models, simulations, decision theory, systems analysis
Time perspective	Orientation to the past	Ad hoc adaptiveness, experimentation	Future orientation: forecasting and planning
Design	Game against nature	Game against fabricated future	Game between persons
Axial principle	Traditionalism	Economic growth	Codification of theoretical knowledge

By information I mean data processing in the broadest sense; the storage, retrieval, and processing of data becomes the essential resource for all economic and social exchanges. These include:

a. Data processing of records: payrolls, government benefits (e.g., Social Security), bank clearances, credit clearances, and the like
b. Data processing for scheduling: airline reservations, production scheduling, inventory analysis, product-mix information, and the like
c. Data bases: characteristics of populations as shown by census data, market research, opinion surveys, election data, and the like

By knowledge, I mean an organized set of statements of fact or ideas, presenting a reasoned judgment or an experimental result, which is transmitted to others through some communication medium in some systematic form. Thus, I distinguish knowledge from news or entertainment. Knowledge consists of new judgments (textbook, teaching, and library and archive materials).

In the "production of knowledge," what is produced is an intellectual property, attached to a name or a group of names and certified by copyright or some other form of social recognition (like publication). This knowledge is paid for—in the time spent in writing and research, in the monetary compensation by the communications and educational media. The response of the market, along with administrative and political decisions of superiors or peers, judge the worth of the result and any further claim on social resources that might be made in its behalf. In this sense, knowledge is part of social overhead. More than that, when knowledge becomes involved in some systematic form in the applied transformation of resources (through invention or social design), then one can say that knowledge, not labor, is the source of value.

Economists, in their formal schemes to explain production and exchange, use as key variables "land, labor and capital," though institutionally minded economists such as Werner Sombart and Joseph Schumpeter added the notion of an acquisitive spirit or entrepreneurial initiative. The analytical mode used by economists, the "production function," sets forth the economic mix only as capital and labor—a system that lends itself easily to a labor theory of value, with surplus labor value as congealed capital, but neglects almost entirely the role of knowledge or of organizational innovation and management. Yet with the shortening of labor time and the diminution of the production worker (who in Marxist theory is the source of value, since most services are classified as nonproductive labor), it becomes clear that knowledge and its applications replace labor as the source of "added value" in the national product. In that sense, just as capital and labor have been the central variables of industrial society, so information and knowledge are the crucial variables of postindustrial society.

INTELLECTUAL FOUNDATIONS OF THE REVOLUTION IN COMMUNICATIONS

For Goethe, the basis of the human community was communication. Decades before other persons spoke of such projects, he envisaged a Panama Canal, a Suez Canal, and a canal between the Rhine and the Danube as the means by which the human community might become more closely intertwined. But it was the Canadian economic historian Harold Innis, more than any other person, who saw changes in the modes of communication, rather than production and property relations, as the key to transitions from one stage of society to another.

Western civilization has been profoundly influenced by communication . . . [and can be] divided into the following periods in relation to media of communication: clay, the stylus and cuneiform script from the beginnings of civilization in Mesopotamia; papyrus, the brush and hieroglyphics and hieratic to the Graeco-Roman period, and the reed pen and the alphabet to the retreat of the Empire from the west; parchment and pen to the tenth century of the dark ages; and overlapping with paper, the latter becoming more important with the invention of printing; paper and the brush in China, and paper and the pen in Europe before the invention of printing or the Renaissance; paper and the printing press under handicraft methods to the beginning of the nineteenth century, or from the Reformation to the French Revolution; paper produced by machinery and the application of power to the printing press since the beginning of the nineteenth century to paper manufactured from wood in the second half of the century, celluloid in the growth of the cinema; and finally the radio in the second quarter of the present century. In each period I have attempted to trace the implications of the media of communication for the character of knowledge and to suggest that a monopoly or an oligopoly of knowledge is built up to the point that equilibrium is disturbed.[6]

Innis was a technological determinist. He thought that the technology of communication was basic to all other technology: for if tool technology was an extension of man's physical powers, communication technology, as the extension of perception and knowledge, was the enlargement of consciousness. He argued not only that each stage of Western civilization was dominated by a particular medium of communication but that the rise of a new mode was invariably followed by cultural disturbances.[7]

One can say that the new media of communication today are television or the computer, or the variant modes of storage, retrieval, and transmission that will arise through the "fusing" of technologies. But the core of the present communications revolution is not a specific technology but the set of concepts represented by the term *information theory*

The Statistics of Language

Information theory arose from the work of Claude Shannon on switching circuits to increase "channel capacity," the design for which he derived

from the algebra of logic. The algebra of logic is an algebra of choice and deals with the range of choices in a determinate sequence of alternative possibilities in the routing of a message. The parlor game of "Twenty Questions" is often taken as a conventional illustration of how one narrows a range of possibilities by asking a series of yes or no questions. As Shannon points out in the article on information theory that he wrote for the *Encyclopaedia Britannica*, "The writing of English sentences can be thought of as a process of choice: choosing a first word from possible first words with various probabilities; then a second with probabilities depending on the first; etc. This kind of statistical process is called a stochastic process, and information sources are thought of, in information theory, as stochastic processes."

The information rate of written English can be translated into bits (*binary digits* 1 and 0), so that if each letter occurred with equal frequency, there would be 4.76 bits per letter. But since the frequencies are unequal (E is common; Z, Q, and X are not), the actual rate is one bit per letter. Technically, English is said to be 80 percent "redundant," a fact that one can immediately ascertain by "deciphering" a sentence from which various vowels or consonants have been deleted. By knowing the statistical structure of a language, one can derive a general formula that determines the rate at which information can be produced statistically and create huge savings in transmission time. But though transmission was the impetus to the formulation of information theory, the heart of the concept is the idea of coding. Messages have to go through "channels"; inevitably, they are distorted by "noise" and other forms of "resistance" that arise from the physical properties of the channel. What Shannon found was that it is possible to encode a message that can be accurately transmitted even if the channel of communication is faulty, so long as there is enough capacity in that channel.

Shannon's mathematical theory had immediate application to industry. The theoretical and statistical underpinnings seemed to confirm the more general theory of Wiener's *Cybernetics*, a work that had been commissioned by an obscure publisher in France after the war and became an immediate best-seller on its publication by Wiley in 1948. What Shannon's and Wiener's work seemed to promise was the move toward some general unified theory of physics and human behavior (at least in physiology, psychology and linguistics, through the concept of information. As Shannon himself wrote in his *Britannica* essay:

> A basic idea in communication theory is that information can be treated very much like a physical quantity such as mass or energy. . . .
>
> The formula for the amount of information is identical in form with equations representing entropy in statistical mechanics, and suggests that there may be deep-lying connections between thermodynamics and information theory. Some scientists believe that a proper statement of the second law of thermodynamics requires a term relating to information. These connections with physics, however, do not have to be considered in the engineering and other applications of information theory.[8]

But this is a confusion of realms—compounded by the facile use of the word *entropy* to equate the degree of disorder or noise (i.e., the loss of accuracy) in communication with the loss of heat or energy in transformational activities in physics. As Wiener put it in his *Cybernetics*, resisting the easy comparisons of living with mechanical organisms, "Information is information, not matter or energy. No materialism which does not admit this can survive at the present day."[9]

However true it may be as a statistical concept that information is a quantity, in its broadest sense—to distinguish between information and fabrication—information is a pattern or design that rearranges data for instrumental purposes, while knowledge is the set of reasoned judgments that evaluates the adequacy of the pattern for the purposes for which the information is designed. Information is thus pattern recognition, subject to reorganization by the knower, in accordance with specified purposes. What is common to this and to all intellectual enterprises is the concept of relevant structure. This concept is what underlies the shift, in the works of Cyril Stanley Smith, from "matter to materials," from the classificatory and even combinational arrangements of elementary properties of matter that began with the pre-Socratics to our present-day understanding of the structural relations of the properties of materials.

These structural relations—in science, as in the economy—fall into two separate domains. The first is the transformation of matter and energy, from one material form into another. The second is the transformation of information from one pattern into another. As Anthony Oettinger puts it in an aphorism, "Without matter there is nothing; without energy matter is inert; and without information, matter and energy are disorganized, hence useless."

The Use of Models

Technological revolutions, even if intellectual in their foundations, become symbolized if not embodied in some tangible "thing," and in the postindustrial society that "thing" is the computer. If, as Paul Valery said, electricity was the agent that transformed the second half of the nineteenth century, in a similar vein the computer has been the "analytical engine" that has transformed the second half of the twentieth century. What electricity did—as the source of light, power, and communication—was to create the "mass society"; that is, to extend the range of social ties and the interaction between persons and so magnify what Durkheim called

the social density of society. In that respect, the computer is a tool for managing the mass society, since it is the mechanism that orders and processes the transactions whose huge number has been mounting almost exponentially because of the increase in social interactions.

The major sociopolitical question facing the mass society is whether we can manage the economy effectively enough to achieve our social goals. The development of computers has allowed us to construct detailed models of the economy. Wassily Leontieff recently described the extraordinary expansion of the input-output system:

> The first input-output tables describing the flow of goods and services between the different sectors of the American economy in census years 1919 through 1929 were published in 1936. They were based on a rather gross segregation of all economic activities in 44 sectors. Because of the lack of computing facilities, these had to be further grouped into only 10 sectors, for the purposes of actual analytic calculations.
>
> The data base, the computing facilities, and the analytical techniques have advanced much further than could have been anticipated forty years ago. National input-output tables containing up to 700 distinct sectors are being compiled on a current basis, as are tables for individual, regional, state and metropolitan areas. Private enterprise has now entered the input-output business. For a fee one can now purchase a single row of a table showing the deliveries of a particular product, say, coated laminated fabrics or farming machine tools, not only to different industries but to individual plants within each industry segregated by zip code areas.[10]

Though it is clear that economists are able to model the economy and do computer simulations of alternative policies to test their consequences, it is much less clear whether such models allow us to manage the economy. The critical point is that the crucial decisions for any society are the political ones, and these are not derivative from economic factors.

Can one model a society? One immediate problem is that we do not have any persuasive theories of how a society hangs together, though paradoxically, because of our understanding of technology, we have a better idea of how societies change. One can only model a closed or finite system; the econometric models operate within a closed system. Yet society is increasingly open and indeterminate, and as men become more conscious of goals there is greater debate about decisions. Decisions on social policy become more and more a matter within the purview of the political system rather than of aggregate market decisions, and this, too, weakens our ability to model a society.

[illegible] intrinsic to the structure of large numbers that could [illegible] becoming the instrument for the modeling and prediction of any complex system. John von Neumann, one of the pioneers in the development of the theory of electronic computing, thought that the prediction of weather would be possible once computers became sophisticated enough to handle all the numerous interacting variables in the atmosphere. Yet as Tjalling Koopmans and others have pointed out, beyond a certain threshold introducing added complexity results in answers that are less and less reliable. Thus the effort to optimize an objective by seeking for complete information may be self-defeating. The social world is not a Laplacean universe where one can plot, from the initial values, the determinate rates of change of other phenomena. If so many parts of the physical world now require us to deal with a calculus of possibility rather than determined regularities, this is even more true in a social world where men are less and less willing passively to accept existing arrangements but instead work actively to remake them. By letting us know the risks and probabilities, the computer has become a powerful tool for exploring the permutations and combinations of different choices and for calculating their consequences, the odds of success or failure. The computer does this by using a binary code that with high speed can answer a question with a yes or a no. What it cannot do, obviously, is to decide like a roulette wheel whether to stop on the yes or on the no.

The Economics of Information

Information is central to all economic transactions—indeed, perfect information is the indispensable condition for perfect competition in general equilibrium theory. Yet we have no economic theory of information, and the character of information, as distinct from the character of goods poses some novel problems for economic theorists.

In a price and market economy, the condition for efficiency, or optimal use of resources, is complete information among buyers and sellers, so that one can obtain the "best" price for one's goods or services. But with the widening of markets and the reduction of distances by transportation and communication—which also enlarges the sphere of competition—efficiency increasingly demands not only a knowledge of contemporary alternatives but of the likely future ones as well, since political decisions or new technologies may radically alter prices. A political embargo may cut off the supplies of a resource. A tax cut or a tax rise will affect the level of spending. New technologies may sharply cut the price of a product (witness the extraordinary changes in two years in the [illegible] calculators), leaving firms with large inventories or [illegible] production techniques at a great disadvantage.

Information, as Kenneth Arrow puts it, reduces uncertainty.[11] The random-walk theory that one cannot "beat the stock market" is based on the assumption that stock prices reflect new information about companies so quickly that investors have little chance to earn better-than-average

[illegible] of their money [illegible] wiser strategy is to place one's money in an index fund that reflects the average prices of the market as a [illegible] is enhanced by access to a wider [illegible]. Accurate crop reporting controls the vagaries of the [illegible] market in commodities. One can multiply the illustrations indefinitely.

But information is not a commodity, at least not in the way the term is used in neoclassical economics or understood in industrial society. Industrial commodities are produced in discrete, identifiable units, exchanged and [illegible] consumed and used up, like a loaf of bread or an automobile. One [illegible] the product from a seller and takes physical possession of it; the exchange is governed by legal rules of contract. In the manufacture of [illegible] one can set up a "production function" (i.e., the relative [illegible] capital and labor to be employed) and determine the appropriate mix relative to the costs of each factor.

Information or knowledge, even when it is sold, remains with the producer. It is a "collective good" in that once it has been created, it is by its nature available to all.[12] In fact, the character of science itself, as a cooperative venture of knowledge, depends on the open and complete transmission of all new experiments and discoveries to others in the field. Multiple discoveries of the same theory or experimental result or technique, which Robert Merton argues is a more dominant pattern in science than the image of the lonely genius or scholar, are one result of this [illegible] and the rapid spread of knowledge.[13]

[illegible] knowledge is a collective good there is little incentive for any individual enterprise to pay for the search for such knowledge, unless it can obtain a proprietary advantage, such as a patent or a copyright. But increasingly, patents no longer guarantee exclusiveness, and many firms lose out in spending money on research only to find that a competitor (particularly one overseas) can quickly modify the product and circumvent the patent; similarly, the question of copyright becomes increasingly difficult to police when individuals or libraries can Xerox whatever pages they need from technical journals or books or when individuals and schools can tape music off the air or record a television performance on video discs. But more generally, the results of investing in information (i.e., doing research), are themselves uncertain. Because firms are averse to risk, they tend to undervalue such investments from the social point of view, and this leads to underinvestment in private research and development.

If there is less and less incentive for individual persons or private enterprises to produce knowledge without particular gain, then the need and effort falls increasingly on some social unit, be it university or government, to underwrite the costs. And since there is no ready market test (how does

[illegible] economic theory to design a socially optimal policy of investment in knowledge (including how much money should be spent for basic research, what allocations should be made for education, and for what fields: in what areas of health do we obtain the "better returns", and so on) and to determine how to "price" information and knowledge to users.[14]

The Merging of Technologies

Through the nineteenth and up to the midtwentieth century, communication could be divided roughly into two distinct realms. One was mail, newspapers, magazines, and books, printed on paper and delivered by physical transport or stored in libraries. The other was telegraph, telephone, radio, and television, coded message image or voice sent by radio signals or through cables from person to person. Technology, which once made for separate industries, is now erasing these distinctions, so that a variety of new alternatives are now available to information users, posing, for that very reason, a major set of policy decisions for the lawmakers of the country.

Inevitably, large vested interests are involved. Just as the substitution of oil for coal and energy and the competition of truck, pipeline, and railroad in transportation created vast economic dislocations in corporate power, occupational structures, trade unions, geographical concentrations, and the like, so the huge changes taking place in communications technology will affect the major industries that are involved in the communications arena.

Broadly, there are five major problem areas:

1. The meshing of the telephone and computer systems, of telecommunications and teleprocessing, into a single mode. A corollary problem is whether transmission will be primarily over telephone-controlled wires or whether there will be independent data-transmission systems. Equally, there is the question of the relative use of microwave relay, satellite transmission, and coaxial cables as transmission systems.
2. The substitution of electronic media for paper processing. This includes electronic banking to eliminate the use of checks; the electronic delivery of mail; the delivery of newspapers or magazines by facsimile rather than by physical transport; and the long-distance copying of documents.
3. The expansion of television through cable systems, to allow for multiple channels and specialized services, and the linkage to home terminals for direct response to the consumer or home from local or central stations. A corollary is the substitution of telecommunication for transportation through videophone, closed-circuit television, and the like.
4. The reorganization of information storage and retrieval systems based

on the computer to allow for interactive network communication in team research and direct retrieval from data banks to library or home terminals.

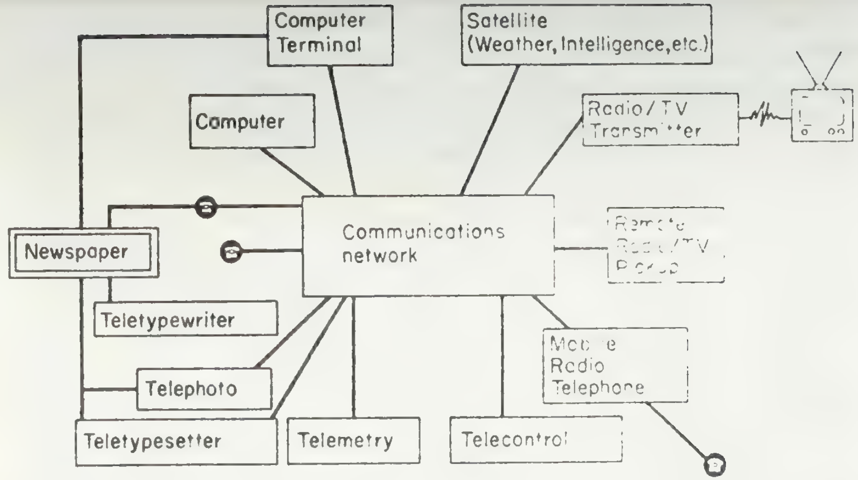
5. The expansion of the education system through computer-aided instruction, the use of satellite communications systems in rural areas, especially in the underdeveloped countries, and the use of video discs both for entertainment and instruction in the home.[15]

Technologically, telecommunications and teleprocessing are merging in a mode that Anthony Oettinger has called "compunications" (see fig. 9.1). As computers come increasingly to be used as switching devices in communications networks and electronic communications facilities become intrinsic elements in computer data-processing services, the distinction between processing and communication becomes indistinguishable. The major questions are legal and economic. Should the industry be regulated or competitive? Should it be dominated, in effect, by AT&T or by IBM?*

The entry of specialized carriers into the business field, undercutting AT&T prices, threatens its consumer rate structure as well, and would create large political upheavals. Yet the "computer" proponents have argued that technological innovation in the telephone field has been stodgy, whereas the energetic and bustling computer field has demonstrated its ability to innovate rapidly and reduce costs and prices, so that competition in transmission, in the end, would serve the country as a whole.

The questions I have been raising about the fusion of communications technologies—the rise of compunications—are not only technological and economic but, most important, political. Information is power. Control over communications services is a source of power. Access to communication is a condition of freedom. There are legal questions that derive directly from this. The electronic media, such as television, are regulated, with explicit rules about "fairness" in the presentation of views, access to reply to editorials, and the like. But ultimately the power is governmental. Decisions about the station's future lie with the Federal Communications Commission. The telephone industry is regulated on its rates and conditions of service. The computer industry is unregulated and operates in an open market. The print media are unregulated, and their rights on free speech are zealously guarded by the First Amendment and the courts.

* In 1976, AT&T introduced a bill in Congress to allow it to buy out its microwave competitors, and it wants Congress to require anyone plugging specialized services into its lines to buy a connecting device from the phone company. IBM has entered into a direct challenge to AT&T by setting up The Satellite Business Systems pany jointly with Aetna Insurance and Comsat General to operate a satellite communications service that would transmit the full range of "compunications" by 1981.



9.1
The Changing Telecommunications Network. As of 1974, the 144 million plain old telephones still predominated, but many other devices are now attached to a network that has become an infrastructure basic to most social functions, including many that reach directly into the home. As computers and computer terminals have become increasingly pervasive over the last two decades, the network has developed toward an integrated computer communications or compunications network. From Paul J. Berman and Anthony G. Oettinger, *The Medium and the Telephone: The Politics of Information Resources*, Working Paper 75–8, December 15, 1975, Harvard Program on Information Technologies and Public Policy, Cambridge, Mass.

Libraries have largely been private or locally controlled now great data banks are being assembled by government agencies and by private corporations. Are they to be under government supervision or unregulated? All of these are major questions for the future of the free society and bear on the problem of a national information policy

THE QUANTITATIVE DIMENSIONS OF THE INFORMATION SOCIETY

In 1940, Colin Clark, the Australian economist, wrote his path-breaking *Conditions of Economic Progress*, in which he divided economic activity into three sectors, primary (principally extractive), secondary (primarily manufacturing), and tertiary (services). Any economy is a mixture of all three sectors, but their relative weights are a function of the degree of productivity (output per capita) in each sector. Economic progress is defined as the rate of transfer of labor from one sector to another as a function of differential productivity. As national incomes rise, the expansion of the manufacturing sector is followed by a greater demand for

services and a further corresponding shift in the slope of employment. In this fashion, Clark was able to chart the rate of change from a preindustrial into an industrial society and then into a service society.

The difficulty remains the definition of services. In classical economics, beginning with Adam Smith, services were thought of as unproductive labor. Marx, accepting that distinction, had based one of his theories on the crisis of capitalism, that of the falling rate of profit, on the proposition that as a higher proportion of output shifted from "variable capital" (productive labor) to "constant capital" (machinery, for example), the rate of profit would fall since the base on which surplus value was produced would be shrinking (unless overcome by more intensive exploitation, such as lengthening the working day or speeding up the pace of work). As the notion that services were unproductive became increasingly dubious, economists were faced with a double problem of redefinition: first, determining which services were unproductive (e.g., domestic servants) and which were productive (e.g., education, by increasing the skill of labor, or medicine, by making persons healthier or prolonging working life); second, developing a more adequate set of distinctions within the services category. Some writers sought to restrict the tertiary sector to auxiliary blue-collar work, such as transportation, utilities, repair (e.g., auto mechanics), and personal services (laundry, barbers, and so on), and to define a *quaternary* sector made up essentially of the white-collar industries, such as banking, insurance, and real estate, and a *quinary* sector, made up of knowledge activities like scientific and technical research, education, and medicine. While such distinctions are useful for indicating the complexity of occupational distributions, with them one loses the thrust implicit in the original Colin Clark scheme, with its emphasis on differential productivity as the mechanism for the transition from one type of society to another.

Without pretending to be exhaustive, I have adopted a scheme for the postindustrial society of classifying economic sectors as extractive, fabrication, and information activities. The underlying sociological rationale is that it seeks to look at the character of work as a shaper of the character of individuals. The scheme is based on the distinction that some societies are primarily engaged in games against nature, others in games against fabricated nature (things), and others in games between persons. It also derives from the propositions I have put forward regarding the centrality of knowledge in the postindustrial society, the primacy of a knowledge theory of value as against a labor theory of value, and the growth of information processing within the traditional sectors, such as agriculture, manufacture, and services, which is beginning to transform the character of those sectors as well.

The Measurement of Knowledge

In 1958, Fritz Machlup, then at Princeton University, made the first efforts to measure the production and distribution of knowledge. The definition of knowledge was somewhat unsatisfactory, for Machlup rejected "an objective interpretation according to *what* is known," as against a subjective interpretation derived from what a knower designates as being known.[16] And Machlup worked from the standard national accounts, although in important details he varied from standard usages.[17]

Still, Machlup's painstaking work was crucial. In his accounting scheme, he grouped thirty industries into five major classes of knowledge production, processing, and distribution: (1) education, (2) research and development, (3) media of communication, (4) information machines, and (5) information services. The categories were broad. Education, for example, included education in the home, job, and church as well as in school. Communications media included all commercial printing, stationery, and office supplies. Information machines included musical instruments, signaling devices, and typewriters. Information services included monies spent for securities brokers, real-estate agents, and the like.

Machlup estimated that $136,436 million was spent for knowledge, or 29 percent of gross national product (GNP),[18] and that 31 percent of the labor force was engaged in that sector. Of equal importance, he estimated that between 1947 and 1958, the knowledge industries expanded at a compound growth rate of 10.6 percent a year, which was double that of the GNP itself during the same period. In 1963, Gilbert Burck, an editor of *Fortune*, replicated Machlup's estimates and calculated that in that year knowledge produced a value added of $159 billion, or 33 percent of the GNP.[19] Five years later, Professor Jacob Marschak, one of the most eminent economists in the United States, in computations made in 1968, said that the knowledge industries would approach 40 percent of the GNP in the 1970s.[20]

The last decade has in fact seen enormous growth in the "information economy," which includes various fields. In education, while the rate of growth of college education has slowed down, there has been a continuing increase in adult education which, in fact, has maintained its rise. In health, the expansion of health services continues, particularly with the multiplication of federal legislation. Information and data processing continue to rise, particularly as the volume of transactions and record keeping increases. Telecommunications finds its major area of growth in international communications, particularly with the launching of new satellites. Television is on the threshold of a number of major changes with the growth of both cable television and video discs.

Still, if one wanted to measure the actual economic magnitudes of the

information economy, the difficulty is that there is no comprehensive conceptual scheme that can divide the sector logically into neatly distinct units, making it possible to measure the trends in each unit over time. A logical set of categories might consist of the following: knowledge (which would include situses such as education, research and development, libraries, and occupations that apply knowledge, such as lawyers, doctors, and accountants); entertainment (which would include motion pictures, television, the music industry); economic transactions and records (banking, insurance, brokerage); and infrastructure services (telecommunications, computers and programs, and so on).

Two somewhat different approaches have been adopted. Anthony Oettinger and his colleagues have taken the "information industries" from the Standard Industrial Classification used by the U.S. Census and listed their gross revenues in order to provide some crude baselines to measure changes. The difficulty here is that merging technologies and double counting defeat such efforts. The second approach, a more difficult and pioneering effort, is that of Marc Porat, which is to use the National Income Accounts to define a primary sector, the direct sale of information services (like education, banking, advertising) to consumers, and then to define a secondary sector—the planning, programming, and information activities of private and public bureaucracies in enterprises and government—and impute the value added by such activities to the national product and national income.

The Information Economy

Marc Porat has broken down the National Income Accounts for 1967 in order to see what portions may be attributable, directly and indirectly, to information activities. In doing this, he has used three measures to compute gross national product. One is "final demand" (which eliminates the intermediate transactions that would add up to double counting), the second is "value added," which is the actual value added by a specific industry or component of an industry to the product, and the third is the income or compensation received by those who create these goods and services. Theoretically, the totals of all three figures should be equal; in fact, for statistical reasons, in part owing to different methods of collection, the figures do not always dovetail exactly. But the virtue of using all three is that one can make different analytical distinctions. For my purposes, the most important measure is that of value added, for with it one can seek to determine the actual services provided by information activities and then check these figures against the income or compensations received by those engaged in providing the services.

Porat's work is the first empirical demonstration of the scope of information activities since Machlup, but it goes far beyond Machlup's work, no only because it uses finer categories and makes three different kinds o estimations, but also because it seeks to establish an input-output matri that would permit, once the accounts were complete, an estimation of the impact on other parts of the economy of a change, say, from a "pape economy" to an "electronic transmission" economy or from books t video discs as modes of instruction, along with hundreds of similar ques tions. Here, however, I am interested primarily in Porat's findings on the value of information activities in the economy.[21]

Porat sets up a six-sector economy. There is a primary informatio sector which includes all industries that produce information machines o market information services as a commodity. (This includes the privat sector, which contributes about 90 percent of the primary informatio products and services, and the government, which accounts for the re maining 10 percent.) There is a secondary information sector with tw segments, the public bureaucracy and those private bureaucracies whos activities are not directly counted in the national accounts as informatio services—such as the planning, programming, scheduling, and marketin of goods or services—yet who are actually engaged in information an knowledge work. The value of these activities has to be imputed (fo example, by factoring out the income or compensation of those person within a manufacturing firm who are engaged in such work). The thre remaining sectors consist of the private productive sector, producin goods; the public productive sectors (building roads, dams, and so on) and the household sector.

The primary information sector is the one that is most easily measurab.e since it sells its products in a market. It includes industries and activities a diverse as computer manufacturing and services, telecommunications printing, media, advertising, accounting, and education; it is the produc tive locus of an information-based economy.* In 1967, sales of informatio goods and services in the primary information sector to the four majo sectors of final demand amounted to $174.6 billion, or 21.9 percent o

* Porat divides the sector into eight major classes of industries: (1) the knowledg production and inventive industries; (2) information distribution and communic tion industries; (3) risk-management industries, including components of financ and insurance; (4) search and coordination industries, including all market informa tion and advertising vendors; (5) information processing and transmission service both electronic and nonelectronic; (6) information goods industries, including in formation machines; (7) selected government activities that have direct mark analogs in the primary information sector, including the Postal Service and educa tion; and (8) support facilities such as office and education buildings.

These eight major groups are further subdivided into 116 industries, which can b located in the Standard Industrial Classification; the monetary figures can be lo cated in the National Income Accounts.

GNP. In other words, seventeen cents of every consumer dollar represented direct purchase of information goods and services. If one looks at the income side, in 1967 nearly 27 percent of all income originated with information goods and services. The civilian government was the most information-intensive—almost 43 percent of all federal, state, and local wages were paid to federal primary information-creating personnel such as Postal Service workers or education workers.

Strikingly, as Porat points out, over 43 percent of all corporate profits originated with the primary information industries. All corporations in the United States earned some $79.3 billion in profits in 1967; the primary information industries earned $33.7 billion. After removing the government's share of the primary information sector's national income ($37.2 billion), the information industries alone accounted for 21 percent of national income but 42 percent of corporate profits. Each dollar of employee compensation generated thirty-four cents in profits, as against a ratio in the overall economy of twenty-one cents—a difference that Porat attributes to the large profits earned by the telephone and banking industries with their high profit-to-labor ratios. Calculating value added, about 25 percent of total GNP originated in the primary information industries. In all, over $200 billion of the total GNP of $795.4 billion originated in information goods and services.

The most interesting and novel aspect of Porat's work is the definition and measurement of the secondary information sector, a sector that Porat derives from Galbraith's notion of the "technostructure." This is the section of an industry that is directly engaged in information work but whose activities are not measured as such, for while the goods produced may be sold in the market (and thus are reflected in the GNP as manufactured goods like automobiles or transportation activities like airline flights), the information components in those enterprises—the planning, scheduling, and marketing activities in automobiles; the computerized reservation processes in airline flights—are not counted directly in the GNP.

The secondary information sector expands for several reasons. One is the inherent tendency for bureaucracies to grow, which while true is a quite simple-minded explanation since there are always constraints of costs. A second, more serious reason is the multiplication of technical activities that comes with size, complexity, and advanced technology—such as research, planning, quality control, marketing, and the like. And third is the fact that firms integrate or coordinate to economize on information costs. Thus a group of independent, high-quality hotels in different cities recently banded together to create a common reservation service as a means of competing with the large hotel chains by saving on communications costs. In fact, as Porat points out, there are quasi-industries hidden within the secondary sector that under some circumstances could become independent, primary (i.e., directly measurable) industries. One is the hypothetical "reservations industry." This "industry" sells its services to airlines, trains, hotels, theater box offices, and automobile rental companies through computerized data networks. In actual fact, each of the industries or firms maintains its own reservations systems, so the information costs are counted within the product cost. Yet if a single company created an efficient reservations network that it could sell to all these industries to replace the in-house services they maintain themselves, then these information activities would be measured in the "final demand" of GNP.

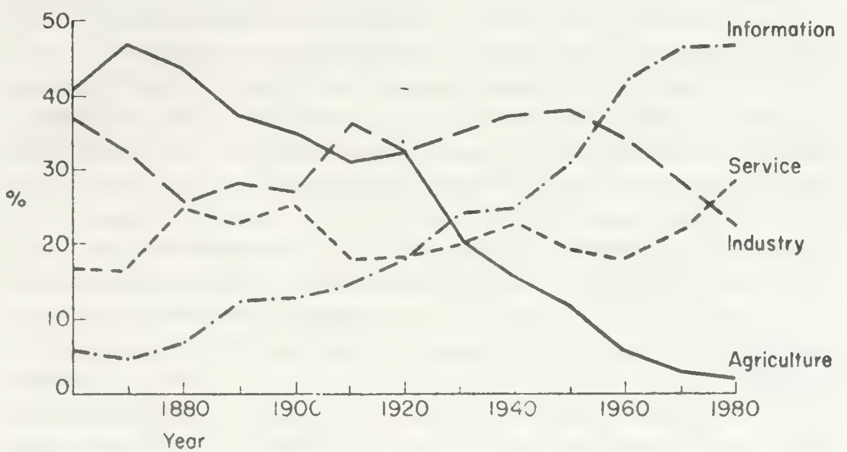
Other than these quasi-information industries, the bulk of the secondary information sector consists of planning and financial control, the administrative superstructure that organizes and manages the activities of firms or government agencies—in short, the private and public bureaucracies. In 1967, according to Porat, 21 percent of GNP originated in the secondary information sector—18.8 percent in the private bureaucracies and 2.4 percent in the public bureaucracies. Of the 168.1 billion in value added, some 83 percent ($139.4 billion) originated in compensation to information workers, some 3.5 percent ($5.8 billion) represented depreciation charges on information machines, and the balance was earned by proprietors performing information tasks. In sum, nearly 50 percent of GNP, and more than 50 percent of wages and salaries, derive from the production, processing, and distribution of information goods and services. It is in that sense that we have become an information economy.

The growth of the secondary sector is, of course, the growth of the bureaucratic society. In 1929, some 13 percent of the national income originated in the secondary sector, but by 1933 it had fallen to 9 percent. During the depression, the secondary sector shrank from 72 percent of the size of the primary information sector to 40 percent. But it is in the war and postwar years, with the expansion of government and the growth of corporate size, that the secondary information sector begins to swell, so that by 1974, about 25 percent of the national income could be attributed to the secondary information sector and about 29 percent of the national income to the primary sector.

The final necessary component is the change in the composition of the work force itself over time. From 1860 to about 1906, the largest single group in the work force was in agriculture. In the next period, until about 1954, the predominant group was industrial. Currently, the predominant group consists of information workers. By 1975, the information workers had surpassed the noninformation group as a whole. On the basis of income received, the crossover came earlier, since those in information occupations, on the average, earn a higher income. By 1967, some 53 percent of the total compensation was paid to information workers.

Figure 9.2 and tables 9.2 and 9.3 illustrate the change. In 1930, there were 12 million workers in the information sector, almost 10.5 million in agriculture, 18 million in industry, and 10 million in services. By 1970, there were 37 million in the information sector, less than 2.5 million in agriculture, 22.9 million in industry, and 17.5 million in services. In percentage terms, the labor force in the information sector today is over 46 percent; in agriculture, 3 percent; in industry 28.6 percent; and in services 21.9 percent.

What of the future? Extrapolations can be deceptive. The information sector has grown hugely in the last decade and a half, but that has been a result of both the rapid introduction of new technology in computers and telecommunications and the economic growth rate that financed it. In many sectors, such as education, public policy is the decisive variable. Although the cohort of younger people will begin to shrink—in absolute numbers it is still growing, but the rate is slowing rapidly—there is an evident desire on the part of many in the adult population to undertake continuing education. Thus many community colleges are finding themselves transformed into adult schools. Whether or not society can afford these costs or wants to pay them is a different question. But aside from issues of public policy the expansion of the information economy will largely depend on two developments. One is automation—in industry and in the white-collar occupations. The second is the growth of information and its retrieval—data bases, scientific information networks, and the explosion of international communications.



9.2
Four-Sector Aggregation of the U.S. Work Force, 1860–1980 (using median estimates of information workers)

Table 9.2
Four-Sector Aggregation of the U.S. Labor Force (Median Definition)

Year	Information Sector	Agriculture Sector	Industry Sector	Service Sector	Total
Experienced Civilian Work Force					
1860	480,604	3,364,230	3,065,924	1,375,525	8,286,283
1870	601,018	5,884,971	4,006,789	2,028,438	12,521,216
1880	1,131,415	7,606,590	4,386,409	4,281,970	17,406,384
1890	2,821,500	8,464,500	6,393,883	5,074,149	22,754,032
1900	3,732,371	10,293,179	7,814,652	7 318,947	29,159,149
1910	5,930,193	12,377,785	14,447,382	7,044,592	39,799,952
1920	8,016,054	14,718,742	14,492,300	8,061,342	45,288,438
1930	12,508,959	10,415,623	18,023,113	10,109,284	51,056,979
1940	13,337,958	8,233,624	19,928,422	12,082,376	53,582,380
1950	17,815,978	6,883,446	22,154,285	10,990,378	57,844,087
1960	28,478,317	4,068,511	23,597,364	11,661,326	67,805,518
1970	37,167,513	2,466,883	22,925,095	17,511,639	80,071,130
1980[a]	44,650,721	2,012,157	21,558,824	27,595,297	95,816,999
Percentages					
1860	5.8	40.6	37.0	16 6	100
1870	4.8	47.0	32.0	16.2	100
1880	6.5	43.7	25.2	24 6	100
1890	12.4	37.2	28.1	22 3	100
1900	12.8	35.3	26.8	25 1	100
1910	14.9	31.1	36.3	17 7	100
1920	17.7	32.5	32 0	17 8	100
1930	24.5	20.4	35.3	19.8	100
1940	24.9	15.4	37.2	22.5	100
1950	30.8	11.9	38.3	19.0	100
1960	42.0	6.0	34.8	17.2	100
1970	46.4	3.1	28.6	21.9	100
1980[a]	46.6	2.1	22.5	28.8	100

[a]Bureau of Labor Statistics projection

Table 9.3
Two-Sector Aggregation of the U.S. Labor Force

Experienced Civilian Work Force

	Inclusive Definition		Restrictive Definition		
Year	Information Workers	Non-information Workers	Information Workers	Non-information Workers	Total U.S. Labor Force
1860	580,040	7,706,243	372,883	7,913,400	8,286,283
1870	788,837	11,732,379	500,849	12,020,367	12,521,216
1880	1,340,292	16,066,092	887,726	16,518,658	17,406,384
1890	2,980,778	19,773,254	2,480,189	20,273,843	22,754,032
1900	4,286,395	24,872,754	3,120,029	26,039,120	29,159,149
1910	7,283,391	32,516,561	4,537,196	35,262,756	39,799,952
1920	9,963,456	35,324,982	6,023,362	39,265,076	45,288,438
1930	16,031,889	35,025,090	8,883,914	42,173,065	51,056,979
1940	16,470,313	37,112,067	9,883,428	43,698,952	53,582,380
1950	21,691,522	36,152,565	13,940,424	43,903,663	57,844,087
1960	30,851,510	36,954,008	19,256,767	48,548,751	67,805,518
1970	[illegible]	[illegible]	29,464,497	50,606,633	80,071,130
1980[a]	49,154,120	46,662,879	39,955,688	55,861,311	95,816,999
Percentages					
1860	7.0	93.0	4.5	95.5	100
1870	6.3	93.7	4.0	96.0	100
1880	7.7	92.3	5.1	94.9	100
1890	13.1	86.9	10.9	89.1	100
1900	14.7	85.3	10.7	89.3	100
1910	18.3	81.7	11.4	88.6	100
1920	22.0	78.0	13.3	86.7	100
1930	31.4	68.6	17.4	82.6	100
1940	30.7	69.3	18.4	81.6	100
1950	37.5	62.5	24.1	75.9	100
1960	45.5	54.5	28.4	71.6	100
1970	50.6	49.4	36.8	63.2	100
1980[a]	51.3	48.7	41.7	58.3	100

[a]Bureau of Labor Statistics projection

FUTURE PROBLEMS: THE RETRIEVAL OF INFORMATION

In his *Sartor Resartus*, Thomas Carlyle wrote ironically, "He who first shortened the labour of the Copyists by the device of movable type was disbanding hired Armies. . . ." He was, of course, referring to Johann Gutenberg (and praising him as well for "cashiering most Kings and Senates and creating a whole new Democratic world: he had invented the art of printing"). Yet such "technological" displacement, characteristically, had contradictory results. While old-fashioned calligraphers no longer could practice their skill and thus were relegated to the artisan scrap heap, more jobs were created by the increased demand for printed materials, and newer, less artistic but differently skilled men found employment.

And yet initially the pace of change was not so abrupt and rapid as to create wholesale turnovers in the print trades of the time. The printing press of the eighteenth century was little different than that used by Gutenberg three hundred years before. It was a wooden handpress on which a flat plate was laid upon a flat piece of paper with pressure created by the tightening of screws. Wood was eventually replaced by metal and the screw by a double lever, which allowed the speed of printing to be increased by half. By 1800 a radically new method of printing using a rotating cylinder—the basis of the modern press until the development of photographic technologies—was invented and with its greater speed began gradually to displace the flat press. The double rotary cylinder, developed for newspapers in the 1850s, made it possible to print two sides of a piece of paper at once. By 1893, the *New York World*'s octuple rotary press was printing 96,000 copies of eight pages in a single hour, whereas seventy years before the average was 2,500 pages an hour.[22]

Such developments, understandably, went hand in hand with complementary technologies. The linotype, developed by Mergenthaler in 1868, replaced monotype by selecting and casting type by keyboard, reducing composition costs by half while quintupling the speed of typesetting. The paper industry, which until the early nineteenth century was a time-consuming hand process using rags, was transformed in the middle of the century by the Fourdrinier process which mechanized the production of paper with the use of wire webs and cylinders. At the same time the development of wood pulp and a practical pulping process displaced rags, so that paper which had cost almost $350 a ton at mid-century had come down to $36 a ton by the end of the century. Each of these developments was sped by new sources of energy. Printing presses, originally turned by hand and briefly even by horse (in America at least), became powered by steam and then by electricity. Papermaking, dependent in-

itially on waterpower, came to use hydraulic power accelerated by electric turbines.

But what is so striking is how long it took, from the time of Gutenberg, for all this to develop. It is only in the twentieth century that one finds the mass production of newspapers (with millions of copies of a single issue printed overnight), magazines (set and printed in widely dispersed places using common tapes), and books. And now, with the revolution in communications, all this will change. The information explosion is a set of reciprocal relations between the expansion of science, the hitching of that science to a new technology, and the growing demand for news, entertainment, and instrumental knowledge, all in the context of a rapidly increasing population, more literate and more educated, living in a vastly enlarged world that is now tied together, almost in real time, by cable, telephone, and international satellite, whose inhabitants are made aware of each other by the vivid pictorial imagery of television, and that has at its disposal large data banks of computerized information.

Given this huge explosion in news, statistical data, and information, it is almost impossible to provide any set of measurements to chart its growth. Yet there is one area—the growth of scientific information—where some reconstruction of historical trends has been carried out, and I will use that as a baseline for understanding the problems of the next twenty years.

The historical picture of the knowledge explosion was first formulated statistically by Derek de Solla Price in 1963, in his work *Little Science, Big Science*. The first two scientific journals appeared in the mid-seventeenth century, the *Journal des savants* in Paris and the *Philosophical Transactions of the Royal Society* in London. By the middle of the eighteenth century, there were only ten scientific journals, by 1800 about 100, by 1850 perhaps 1,000. Today? There are no exact statistics on the number of scientific journals being published in the world. Estimates range between 30,000 and 100,000, which itself is an indication of both the difficulty of definition and the difficulty of keeping track of new and disappearing journals. In 1963, Price estimated that 50,000 journals had been founded, of which 30,000 were still surviving. A UNESCO report in 1971 put the figure between 50,000 and 70,000. *Ulrich's International Periodicals Directory* (a standard library source) in 1971–72 listed 56,000 titles in 220 subjects, of which more than half were in the sciences, medicine, and technology; but these were only of periodicals in the Latin script and excluded most Slavic, Arabic, Oriental, and African languages.

Perhaps the most directly measurable indicators are university library holdings. The Johns Hopkins University in 1900 had 100,000 books and ranked tenth among American university libraries. By 1970, it had over 1½ million volumes, a growth of 3.9 percent per year, although it had dropped to twentieth place. In that same period, the eighty-five major American universities were doubling the number of books in their libraries every seventeen years, for an annual growth rate of 4.1 percent. (The difference between 3.9 and 4.1 percent may seem slight, yet it relegated the Johns Hopkins Library to the bottom of the second decile.)

A 1973 OECD survey of all the extant studies of the growth in scientific knowledge came to the following conclusions:

1. In all the case studies, growth follows a geometric progression, the curve being exponential.
2. However, the growth rates varied considerably, the lowest one being 3.5 percent yearly, the highest 14.4 percent.
3. The lowest growth rates are shown by the number of scientific periodicals published, covering a 300-year period, and the number of specialized bibliographical periodicals involved in indexing and abstracting over a 140-year period. In the case of scientific journals, the annual growth rate has been 3.5, 3.7, or 3.9 percent, depending whether the number published in 1972 is taken as 30,000, 50,000, or 100,000. The growth rate for indexing and abstracting organizations has been 5.5 percent a year. In 1972, there were 1,800 such services in science.
4. A recent series reporting the number of articles by engineers in civil engineering journals (from 3,000 pages of technical articles in three specialized periodicals in 1946 to 30,000 pages in forty-two specialized periodicals in 1966) shows growth rates of 12.3 percent a year.
5. The growth rate in the number of international scientific and technical congresses increased almost fourfold in twenty years, rising from 1,000 in 1950 to over 3,500 in 1968.[23]

The multiplication in the number of scientific reports and documents has naturally led to the conclusion that such progression cannot continue indefinitely, that at some point a slowdown would take place, probably in the form of a logistic curve that would symmetrically match the exponential rise of the ascent. The crucial question has been to identify the point of inflection where the reverse trend would begin. Derek de Solla Price argued in 1963 that "at some time, undetermined as yet but probably during the 1940s or 1950s, we passed through the mid-period in general logistic curve of science's body politic." In fact, he concluded, saturation may have already arrived.[24]

Yet as Anderla noted in his study for the OECD, "Today it is absolutely certain that these forecasts, repeated without number and echoed almost universally, have failed to materialize, at any rate so far." As evidence, he assembled the number of abstracts published between 1957 and 1971 for nineteen scientific disciplines and demonstrated that between 1957 and 1967 the output increased by nearly two and a half times, for an annual growth rate of 9.5 percent. Over the fourteen years from 1957 to 1971, the

volume increased more than fourfold for a growth rate of 10.6 percent, so that there was an escalation in growth rather than the predicted reverse.[25]

The major reason for this continued escalation is the tendency for science to generate more and more subspecialties, each of which creates its own journals and research reports system. At the same time, cross-disciplinary movements arise to bridge some of the subspecialties, extending the proliferation process even further.

What then of the future? The production of scientific literature is determined in the first instance by the projected rate of increase in the scientific population. It is calculated that in 1970 the scientific population represented about 2 percent of the total labor force. The rate of increase has been estimated variously at between 4.7 and 7.2 percent a year (a fifteen-year and a ten-year doubling time, respectively), although certain categories, such as computer scientists, have been increasing by more than 10 percent annually. Taking 1970 as a base, one can estimate the likely size of the scientific population in 1985 by making three assumptions: an unyielding exponential increase to the horizon year of 1985; a break occurring in 1980, with the logistic curve beginning to slow down at that time, or the point of inflection coming as early as 1975. Given these assumptions, the number of scientists, engineers, and other technicians in 1985 could account for a low of 3.3 percent to a high of 7.2 percent of the total labor force. If one takes the midpoints, between 4 percent and 5.7 percent of the total working population would be scientists and engineers in 1985.

In order to project the volume of information that is likely to be produced, we can take as a base a survey of the U.S. National Academy of Science which revealed that in the early 1970s about 2,000,000 scientific writings of all kinds were issued each year, or between 6,000 and 7,000 articles and reports each working day. For an internally consistent time series, the most reliable indicators are the statistics of abstracts of articles in the leading specialized reviews, which from 1957 to 1971 increased exponentially at a rate of more than 10 percent a year. As with the growth rates in the number of scientists, one can assume breaks in the logistic curves at 1975, 1980, or 1985 and then take a median figure. According to these computations, there is every indication that projections to within a year or two of the 1985 horizon might well lie within the index range of some 300 to 400. In other words, the number of scientific and technical abstracts would be three or four times the present number.

The End of the Alexandrian Library

Clearly, if the explosion in information continues, it cannot be handled by present means. If by 1985 the volume of information is four (low estimate) or seven times (high estimate) that of 1970, then some other ways must be found to organize this onslaught of babel. In one of these pleasant exercises that statisticians like to undertake, it is estimated that under present projections, the Yale University Library would need a permanent staff of 6,000 persons in the year 2040 to cope with the books and research reports that would be coming annually into the library. (Such projections recall earlier ones that if the U.S. telephone system had to handle the current volume of calls solely through operator-assisted methods, then every female in the labor force—a sexist remark obviously made before women's lib—would now be working for AT&T.)

Obviously, the information explosion can only be handled through the expansion of computerized and subsequently automated information systems. The major advance to date has been the computerization of abstracting and indexing services. Most of the printed abstract index bulletins in research libraries are prepared from computer tape. The Chemical Abstract Service (CAS), the largest in the field, is a case in point. Before computerization, it took the CAS about twenty months to produce an annual index; these are now available twice a year, while the unit costs for indexing have decreased from $18.50 to $10.54. Moreover, as the new substances are recorded in the Chemical Registry System—there are now 3,000,000 items in the files—it is possible to store, recreate, and display structure diagrams on video terminals from the computer-readable structure records stored in the system. A further development is the rise of computer-based searching services, drawn from the tape initially used to expedite the printing of indexes. Two American firms, the Systems Development Corporation and Lockheed Information Systems, provide on-line searching to over thirty bibliographic data bases. Together they provide immediate access to over 15 million citations, with an annual increase of approximately 3.5 million citations.[26]

The logic of all this is that the image of the Alexandrian Library—the single building like the Bibliothèque Nationale, the British Museum, or the Library of Congress—where all the world's recorded knowledge is housed in one building, may become a sad monument of the printed past. Data-based stores of information, especially in the scientific and technical field, will come from specialized information centers, transmitted through computer printouts, facsimile, or video display to the user, who will have consulted an index through on-line searching to locate items of interest and then order them on demand.

All this supposes two things. One, the creation of large-scale networks in which a national system is built through the linkage of specialized centers. And two, the automation of data banks so that basic scientific and technical data, from industrial patents to detailed medical information, can be retrieved directly from computers and transmitted to the user. But

both suppositions raise two very different problems. One is the intellectual question raised by Winograd in chapter 4, the distinction between programming a data base, and constructing a program for use as a knowledge base. Retrieving some census items from a data base is a simple matter; but finding kindred and analogous conceptual terms—the handling of ideas—raises all the problems that were first encountered, and never successfully solved, in the effort to achieve sophisticated machine translation of languages.

As early as the pre-Socratics, when philosophy was first becoming self-conscious, there was an awareness of the ambiguities of language and the hope, as with the Pythagoreans, that certainty could be expressed through mathematical relations. Descartes, in creating his analytical geometry, thought he could substitute the "universal language of logic" for the messy imprecisions of ordinary language, as Spinoza felt he could create a "moral geometry" to deal with ethical questions. In each generation that hope has arisen anew. In 1661 a Scotsman, George Dalgarno, published his *Ars Signorum* in which he proposed to group all human knowledge into seventeen sections (such as "politics" and "natural objects") and to label each with a Latin consonant. Vowels would be used to label the subsections into which each section was to be divided, and the process of subdivision was to be continued with consonants and vowels alternating. In this way, any item of knowledge would have a specific reference and identification.[27]

In the twentieth century we have had the effort of Whitehead and Russell to formalize all logic using a mathematical notation, the effort of the logical positivists such as Carnap to construct (in theory) a language that would avoid the ambiguities of ordinary discourse and to propose (in practice) a verifiability principle that would specify which propositions were testable and could be held to "make sense," as against those that were (pejoratively) metaphysical, emotive, or theological and could not, given the nature of language, be "proved." And most recently, in the *Britannica 3*, Mortimer Adler has proposed a new scholastic ordering of knowledge, the *Propaedia*, that would guide encyclopedia users to interrelated sets of relevant terms, as his earlier *Syntopicon* sought to be an intellectual index to the 101 major "ideas" of human thought.

The attempts to discipline human knowledge and create a vast and unified edifice, as Dalgarno and even Leibniz sought to do, were bound to fail. The effort to formalize knowledge or construct artificial languages has proved inadequate. The scholastic orderings of Mortimer Adler may help an individual to trace the bibliographic cross-relationships of ideas, but if the purpose of a library, or a knowledge-based computer program, is to help a historian to assemble evidence or a scholar to "reorder" ideas, then the ambiguity of language itself must be confronted. Terms necessarily vary in different contexts and lend themselves to different interpretations, and historical usages shift over time (consider the problem of defining an intellectual, or the nature of ideology), making the problem of designing a "knowledge" program quite different from designing an "information" program.

The process of creating new knowledge (reasoned judgments) proceeds by what Léon Walras, the great mathematical economist, called *tâtonnement*, trial-and-error tapping, by taking fragments of intellectual mosaics whose larger shapes cannot be predicted in advance and fitting them together in different ways or by regarding large conceptual structures from a new angle, which opens up wholly new prisms of selection and focus. A sophisticated reader, studying a philosophical text, may make use of the existing index at the back of the book, but if he is to absorb and use the ideas in a fruitful way, he has necessarily to create his own index by regrouping and recategorizing the terms that are employed. As John Dewey pointed out in *Art as Experience*, the nature of creativity is to rearrange perceptions, experiences, and ideas into new shapes and modes of consciousness. In this process, no mechanical ordering, no exhaustive set of permutations and combinations, can do the task. Descartes once thought that the geometer with a compass could draw a circle more exactly than an artist could freehand. But a perfect circle, or even a set of interlocking circles, is not art without some larger conceptual context that "redesigns" an older or different way of arranging shapes. Art, and thought, as modes of exploration, remain primarily heuristic.

A more mundane yet sociologically important problem is the lack of a national information policy on science and technical information, let alone on library resources generally. Should there be a national scientific and technical computer network? Should there be a government corporation or utility with direct responsibility to scientific and technical users or simply a major, governmentally organized data base (like the census) made available to commercial services that meet specific consumer needs? Such questions have been raised since the creation of the Office of Science Information within the National Science Foundation in 1956, and they have been asked over and over again in a number of governmental and National Academy of Science studies in subsequent years. No answers have been forthcoming; no policy exists. Yet if science information is the end product of the $35 billion annual investment that the nation makes in research and development and information, broadly defined, accounts for almost 50 percent of the gross national product, then some coherent national policy is in order.

THE POLICY QUESTIONS OF THE INFORMATION SOCIETY

My basic premise has been that knowledge and information are becoming

the strategic resource and transforming agent of the postindustrial society. Inevitably, the onset of far-reaching social changes, especially when they proceed, as these do, through the medium of specific technologies, confronts a society with major policy questions. Here I can only schematically indicate some of the questions society will face in the next two decades.

The New Infrastructure

Every society is connected by diverse channels that permit trade and discourse between its members. These modes, or infrastructures, have usually been the responsibility of government—as builder, financier, maintainer, or regulator. The first infrastructure was transportation—roads, canals, railroads, airways—which breaks down the segmentation of society and allows for the movement of people and goods. Caravans and trade routes formed the social framework of older human societies. The second infrastructure has been the energy utilities—waterpower, steam pipes, gas, electricity, oil pipelines—for the transmission of power. By mobilizing technological rather than natural sources of energy and linking them into power grids, not only have we transformed the lives of cities through lighting but we have provided power for the fabrication of goods and the use of consumer appliances. The third infrastructure has been communications—first the mails and newspapers, then telegraph and telephone, now radio and television—as media for the mounting explosion of messages, the bombardment of sensory experiences, and the increased degree of social and psychic interaction between persons that is now accelerating exponentially.

In the next two decades, there is little likelihood of any major developments in the first infrastructure, that of transportation. The adoption of the *Concorde* or other supersonic airplanes, if it comes, may halve the time for crossing the ocean, but the effect will be minor compared to the reduction in the time needed to cross the Atlantic in the last hundred years, from several weeks by steamship to six days by fast boat, to sixteen hours by propeller plane, to seven hours by jet. Mass transit in the cities, if it returns, is unlikely to replace the automobile or other modes of personal movement unless fuel prices rise so high as to overthrow the hedonistic way of life that has become entrenched in advanced industrial societies. The rising demand for personal transportation in the newer developing countries and increases in congestion may lead to new combinations of taxis, leasing, and motor utilities (in which one shares in a common pool). But much of the vaunted experimental innovations, such as monorails or automated elevated speedways or even hovercraft, have proved to be either uneconomic or technologically too complicated.

In the second infrastructure, energy, there are clearly major new developments requiring large capital expenditures, involving conservation (insulated housing), better extractive techniques for coal and its gasification, potential uses of nuclear energy, research in tapping solar sources of energy, and more efficient modes of electricity transmission, such as superconductivity. These efforts, if made, will stimulate a huge expansion in the areas of research and development (and of engineers and technically trained personnel), and, if successful, will establish new energy grids that will supply a steady source of renewable power and once again bring down the price of energy relative to other goods. But such changes, large as they may be, are primarily substitutes for existing energy sources and modes of transmission. They do not presage huge upheavals in the role energy plays in the society.

The really major social change of the next two decades will come in the third major infrastructure, as the merging technologies of telephone, computer, facsimile, cable television, and video discs lead to a vast reorganization in the modes of communication between persons; the transmission of data; the reduction if not the elimination of paper in transactions and exchanges; new modes of transmitting news, entertainment, and knowledge; and the reorganization of learning that may follow the expansion of computer-assisted instruction and the spread of video discs.

One may be skeptical, as I am, about extravagant claims regarding the quantum leaps in level of education that computer-assisted instruction and video discs will bring. Learning, as I think we have learned, is a function of both the ability to learn and the cultural milieu; any technology is only instrumental, and its impact depends upon other social and cultural factors. But in the realm of data transmission (especially in the world of business) and in the development of knowledge networks (particularly in science and research), what Anthony Oettinger has called compunications certainly will stimulate vast social changes.

This upheaval in telecommunications and knowledge poses two economic-political policy problems, one structural, the other intellectual. The structural question is what kind of technical-economic organization is best designed to be efficient, meet consumer (i.e., industrial, commercial, financial, scientific, library) use, and remain flexible enough to allow for continuing technological development. One proposal is for a single computer utility that would centralize and provide a single source for information and transmission of data for consumer use, either government-owned (as are the telephone and broadcasting systems in many European countries) or privately owned but government-regulated, like AT&T and the major broadcast networks in the United States. Among different versions of the computer utility idea, there is a proposal for diverse sources of information (i.e., different data banks operated publicly or privately) based on a single transmitting system (such as the present telephone quasi-

monopoly) or, conversely, a centralized set of data bases with diverse means of transmission. Against these are the proposals for a completely unregulated, competitive market system, in which different "producers" would be free to set up diverse informational services and transmission would be through cable, microwave, or satellite communication operated by different combines, each competing for the business. These are the issues whose economic aspects Noll has addressed in chapter 12.

It has been argued that a single national computing service, interconnecting all user terminals from geographically dispersed data banks, would achieve vast economies of scale, and if run as a government utility (like TVA) would avoid the concentration of vast power in the hands of a single private enterprise. Against this, as Noll points out, computer systems sell not merely computational power or data processing but "information," and the large and varied needs of thousands of different kinds of users for different kinds of information—medical, technical, economic, marketing—would best be served by specific firms that would be responsive, in the way efficient markets can be, to the diverse needs of consumers. Others have argued that government control could be as dangerous, if not more so, than private concentration since it could be more easily misused for political purposes. And there is the further question of whether a competitive decentralized system would not be more flexible technologically, and more innovative, than a large monopoly system, either public or private. The record so far, in the instance of the computer versus the telephone, would indicate that technological innovation has come more rapidly and more responsively in an unregulated and competitive atmosphere than in the government-regulated sphere.

On the traditional grounds of economic efficiency and technological responsiveness, it seems to me that Noll makes a convincing case for the primacy of the market and for a market system. Yet he also points out that regulators tend to see prices as taxes to be levied according to some calculus of social worth, favoring one group over another, rather than seeing prices as signal-conveying information about costs that induce buyers to make economically efficient decisions. He is, I believe, right in his observation. Yet is the policy itself so wrong? Where markets are open and competitive, the allocation of resources does respond most efficiently to the preferences and demands of consumers, and this is the justifiable defense, theoretically, of the market as the arbiter of economic activity. Yet if in the institutional world income distribution is grossly distorted, or various social groups are discriminated against, then redress through subsidy may be one means of achieving equity, even if sometimes at the expense of efficiency. Second, there is the growing realization that markets do not often reflect the larger range of social costs that are generated in the process, and these may be unfairly distributed. As Arthur Okun has pointed out, the trade-off between efficiency and equity presents a real problem. The point is not to disguise the issue but to make it as explicit as possible, so that one knows the relative gains and losses in equity and efficiency that result from market and regulatory decisions.

The second policy problem posed by the upheaval in telecommunications is intellectual rather than structural and concerns the question of a national information policy, particularly the dissemination of science and technical information. The government is obviously committed to the furtherance of research and development. Increases in productivity depend increasingly on the more efficient distribution of necessary knowledge, but so far there is no unified government policy or an organized system to bring scientific and technical information to diverse users, to speed the process of innovation, and shorten the time of development and diffusion.

After Sputnik, there was a flurry of studies reviewing the problem. A report by William C. Baker of Bell Laboratories stated the unexceptionable principle that the flow of scientific information was necessary. A second report in 1962 by J. H. Crawford for the president's Office of Science and Technology recommended that each agency of government set up a specific office to produce scientific information, and these were created in the Department of Defense, the Atomic Energy Commission, and the National Aeronautic and Space Agency. In 1963, a report by Alvin Weinberg of the Oak Ridge National Laboratory argued that the government had the further responsibility to organize the dissemination of research information in order to avoid costly duplication of effort. The government did create a coordinating body called COASTI (Committee on Scientific and Technical Information) to implement this effort.

Yet the odd if not surprising fact is that little has been done. During the Nixon administration, COASTI, the Office of Science and Technology, and the Science Information Council were dismantled. Inevitably the number of hortatory studies multiplied. In 1969, the National Academy of Sciences and the National Academy of Engineering brought forth the SATCOM (Committee on Scientific and Technical Communication) report, which involved more than 200 scientists, calling for a national policymaking body to deal with information policy. In 1972 the Federal Council on Science and Technology and the National Science Foundation commissioned yet another report, by Dr. Martin Greenberger of Johns Hopkins University, which concluded, unsurprisingly, that the government was not well organized to deal with the problems of scientific and technical information facing the country.

It still is not. Meanwhile, the number of scientific papers and the volume of scientific information continue to rise. There is a growing trend toward cross-disciplinary information which the single-disciplinary systems (such

as abstracting and indexing) are not equipped to handle. The proliferation of diverse types of material, stored in different ways from books, films, computer tapes, video tapes, and so on, makes it difficult to keep track of everything. And finally, the number of users continues to increase.

All trends pose a large variety of policy issues. Should there be, as Fernbach suggests in chapter 8, a national Library of Data, like the Library of Congress, to store all basic data and programs in giant memories? Should this library—if such a Library of Babel as Jorge Luis Borges envisaged ever comes about—also concern itself with the dissemination of data as the government's Medlars system does for medical information, or should it be available for private companies, such as Lockheed or Systems Development Corporation or the *New York Times*, to provide specialized services for subscribers through proprietary communications and terminal systems?

The growth of shared communications systems and on-line terminals makes a national scientific and technical information network a tangible possibility. In chapter 17 Denicoff describes the development of the interactive computer network invented in 1968 by Dr. L. G. Roberts for the Advanced Research Projects Agency (ARPA), which was first employed by the Defense Communications Agency in 1976. Its most valued result, according to Denicoff, was the emergence of a "user community." The operational reality of such a community, he writes, is the proof of the gains we have made in scientific cooperation. In the same vein, Joseph Becker has argued that

> a national scientific and technical information network implies the interconnection of discipline-oriented and mission-oriented information systems for remote use through standard communications. Unless cohesive development takes place, the separate systems will remain insulated from one another and from their users. But, if maximum communication can be established among them, the array can be converted into a national resource of immense value to America's scientific enterprise.[28]

H. G. Wells, in one of his megalomaniacal visions of the future, proposed a "world brain" that like a vast computer would bring together in one place all organized scientific knowledge and make it available through communication networks to the "new samurai," the coming scientific elite of the world. Is such a technological phantasmagoria feasible (as some computer scientists claim it is) or desirable (as others do), or is it simply one of those marvelously simple visions (like that of Sidney Webb) of tidily and neatly organized bundles of knowledge that can be separated and reassembled by pressing the right button? If the last, it is a deceptive vision, which misunderstands the way the mind actually works, and which makes the sociological error of assuming that some central knowledge system can function better than the decentralized, self-organizing system in which demand specifies the organizational and market response to the needs of the users. This is an issue that should remain open to extended debate, for it is too serious and too costly to be settled on purely ideological grounds.

And finally, on a more mundane level, there is the legal and economic question of what is an "intellectual property"—at least where the intellectual product is clearly defined (such as a book or a journal article), let alone where the boundaries are blurred, as in the instance of a computer program. How does one balance the rights of fair use as demanded by libraries against the economic rights of authors and publishers? As books become stored in computer memories and can be retrieved on tapes and printed by attached photocopying devices, who is to pay for what? Should Xerox and IBM receive financial returns while the intellectual producers gain only the psychic satisfaction of the widespread reproduction of their words?

The courts and the Congress have been struggling with these questions for years. Clearly no solution will completely satisfy those who press for the widest possible dissemination of intellectual material under some fair-use and information-need concept, or those who demand payment for any use of copyright material. But we need a clarification of the legal and philosophical issues at stake.

Social and Economic Transformations

The major determinant of policy issues, as I have indicated, is the question of what kind of infrastructure will be created out of the merging technologies of computers and communications. Inevitably this will give rise to more diffuse policy issues deriving from the economic and social transformations that may come in their wake. I will conclude by examining five central issues of this kind.

1. The location of cities Historically, all cities were formed at the crossroads of overland caravan routes, at the strategic confluence of rivers, or at large, protected ports on seaways and oceans as entrepôts and trading centers. Almost all the major cities of the world have been located on rivers, lakes, and oceans since transportation—and particularly waterways for heavy barge loads—tied areas together in the first infrastructure.

In the industrial age, cities were located near major resource bases, such as coal and iron, as one sees in the English Midlands or the German Ruhr and most strikingly in the great industrial heartland of the United States, where the great iron-ore resources of the Mesabi Range in upper Minnesota were connected to the great coal regions in southern Illinois and western Pennsylvania through a network of lakes and rivers. In this way the great industrial cities of Chicago, Detroit, Cleveland, Buffalo, and Pittsburgh were intricately linked in one huge complex.

In the transition to a service economy, the metropolitan cities became

the major financial centers and headquarters for the great enterprises. The histories of New York and London form striking parallels. Both began as port cities through which goods could be sent overseas or transported inland. New York was a large, ice-free port, protected by two great bays, yet connected through the Hudson River and the Erie Canal system to the midwestern Great Lakes complex. As trade increased, banking, factoring, and insurance arose as auxiliary services to commerce; later, with the rise of industry, they became nerve centers for financial and stock transactions. In its third phase, New York became a large headquarters city, where the major corporations located their head offices to take advantage of the external economies offered by the concentration of banking, legal, publishing, and communications services.

In economic geography, the resource base was the decisive locational factor up to the last forty years, when all this began to change. In the United States in the postwar years, the economic map of the country was reworked largely through politics, since the new large aircraft, space, and missile companies were created entirely by government contracts and the decisions to locate them in areas like the Pacific Northwest, southern California, and southwest Texas were made on political grounds. With the rise of air cargo, we have witnessed a phenomenon in which new "airplane cities," such as Dallas–Fort Worth, Houston, Denver, and Atlanta, rather than water and rail cities, serve as regional hubs for industrial and commercial spokes. And now, as the increasing spread (and cheapness) of telecommunications reduces the former external economies of physical proximity, we see the dispersal of corporate headquarters and major white-collar concentrations like the insurance industry from the decaying central cities to the suburbs. The location of research laboratories, new universities, and large hospital complexes is less dependent on the traditional factors of economic geography and more influenced by the nearness of educational facilities, easier life-styles, and political factors. Phenomena like the development of "Silicon Valley" in California—the ribbon of electronics and computer firms stretching from San Francisco to San Jose—and Route 128 around Boston were a response to the availability of university research facilities, plus more pleasant space for the smaller-sized physical plants and offices than the industrial areas could provide.

C. A. Doxiades has envisaged the growth of linear cities without the older focal piazzas and market centers of the classical European towns. B. F. Skinner has suggested that in an age of advanced communication, networks of towns will replace the large, increasingly ungovernable cities. The question of whether these apocalyptic visions will be realized is moot; the life and death of cities is a long historical process. But what is changing is the concept of "urbanism" itself. Thirty years ago Louis Wirth wrote a famous essay entitled "Urbanism as a Way of Life," in which he summed up the characteristics of urbanism as a highly interactive, heavily mobile, culturally and politically attentive mode, as against the older small-town and rural patterns centered on the church and the family. What is happening today is that the entire nation (if not large parts of the world) is becoming urbanized in the psychological sense, though increasingly more dispersed geographically.

The changes in the character and pattern of telecommunications poses problems of national land use, of the social costs of dispersions and concentrations, the management of the decay of old cities, and the control of the sprawl of new ones. Inevitably, the decisions will reflect the interplay of market and political forces, since neither one can be decisive in itself. But it is the exact mix of the two that remains as the interesting sociological question for the next decades.

2. The possibilities of national planning Leon Trotsky once said that a capitalist economy is one where each man thinks for himself and no one thinks for all. That a single "one" can think for "all" is probably impossible and, if so, would be monstrous, since the "one" would be some giant bureaucracy and the "all" a putative single interest equally applicable to all citizens in the society. As Alan Altshuler of MIT has remarked, "those who contend that comprehensive planning should play a large role in the future evolution of societies must argue that the common interests of society's members are their most important interests and constitute a large proportion of all their interests. They must assert that conflicts of interests in society are illusory, that they are about minor matters, or that they can be foreseen and resolved in advance by just arbiters [planners] who understand the total interests of all the parties."

In this respect, Altshuler is probably correct, yet such a view unduly restricts the meaning of planning in all its possible varieties. The different kinds of planning can be arrayed in a simple logical ladder.

a. Coordinated information Almost all major enterprises make five- and even ten-year plans (for product development, capital needs, manpower requirements, new plants) as a necessary component of their own planning. And various services, such as the McGraw-Hill survey of capital spending budgets or the federally financed University of Michigan surveys of consumer intentions, seek to provide more comprehensive information for firms about these trends to aid them in their planning. A national computerized information service, through the Bureau of the Census or some similar government body, could bring together all such relevant information—just as the various econometric models now in use make forecasts of the annual GNP and its major components, which become the basis of both governmental and private policies. To this extent, the idea of a coordinated information system is simply an extension of the planning

process that is now so extensive in the corporate and governmental sectors.[23]

b. Modeling and simulation Using an input-output matrix, such as that developed by Wassily Leontief, one could test alternative economic policies in order to weigh the effects of different government policies on different sectors of the economy. In a more radical version, the Russian economist Leonid Kantorovich has argued that a national computerized economic system, registering the different prices and allocations of items, could spot items that deviate from planned or targeted goals or the disproportionate use of resources in various sectors.

c. Indicative planning In this model, which is used by the French Commissariat du Plan, several thousand industry committees coordinate their plans regarding economic activities, and these plans become the basis of governmental decisions to stimulate or inhibit certain sectors, largely by easier credit facilities or credit restrictions.

d. National goals In this scheme, the government would stipulate certain major goals—the expansion of housing or levels of economic growth—and monitor the economy to see whether such goals were being achieved as a guide to which further measures (tax cuts, investment credits, credit allocations, preferred sections such as housing) might be necessary to achieve them.

e. Mobilized targets This is, in effect, a "war economy," such as that exemplified by the War Production Board in the United States during World War II or the British Ministry of Supply; in practice, it is the actual nature of Soviet "planning." In this system, certain key targets are specified (level of steel output, kind of machine tools, number of tanks and aircraft, and so on), and the government physically allocates, by a priority system, the key materials and manpower to designated factories. In this respect, the entire economy is not planned, but key sectors are controlled.

These different modes of planning range from direct controls and policing at one end to "simple" information coordination at the other. Which kind of planning society will adopt is a political question. Given the degree of interdependence and the spillover effects of various individual decisions, some larger degree of planning—analogous to the rise of environmental monitoring and regulation planning—than we now have is probably inevitable. The computer and the large-scale information systems that are being developed will make it feasible; but how one reconciles planning with various kinds of individual freedom is a very different and more difficult question.

3. Centralization and privacy Police and political surveillance of individuals is much more possible and pervasive because of sophisticated advances in the information process. In a survey of federal agencies' use of computers and data banks, former Senator Sam Ervin wrote in the preface to a report by the Senate Judiciary Committee's Subcommittee on Constitutional Rights: "The sub-committee has discovered numerous instances of agencies starting out with a worthy purpose but going so far beyond what was needed in the way of information that the individual's privacy and right to due process of law are threatened by the very existence of files. . . . The most significant finding is that there are immense numbers of government data banks, cluttered with diverse information on just about every citizen in the country. The 54 agencies surveyed were willing to report 858 [data banks] containing more than 1¼ billion records on individuals."

Government demand for information can be highly costly to enterprises and institutions. Derek Bok, the president of Harvard, reported that the demand of the governmental agency enforcing the affirmative action program for detailed information on every aspect of employment practices and the need to keep records of all job searches for applicants to teaching and other positions cost the university over a million dollars a year. What information is necessary and what is not is a difficult question to decide, particularly in the abstract. Yet the tendency of almost every bureaucracy, reflecting an aspect of Parkinson's Law, is to enlarge its demands on the principle that (a) "all" information might conceivably be necessary; and (b) it is easier to ask for everything than to make discriminations.

The simple point, for it is one of the oldest and most important truisms of politics, is that there is an inherent potential for abuse when any agency with power sets up bureaucratic rules and proceeds without restraint to enforce them. The other, equally simple point, is that control over information lends itself more readily to abuse—from withholding information at one end to unlawful disclosure at the other, both processes exemplified by Watergate—and that institutional restraints are necessary, particularly in the area of information, to check such abuses.

4. Elite and mass Every society we have known has been divided, on one axis or another, into elite and mass. On a different axis, a society may be designated as open or closed. In the past, most societies have been elite and closed in that aristocracies have been hereditary. Even when there has been an examination system for choosing mandarins, as in Imperial China, the selection process has been limited to a small class of persons.

In the West the major elites have traditionally been landed and propertied elites. Even in an occupation like the military, which requires some technical skill, until about a hundred years ago (in Britain, for example) commissions could be purchased. The older ladders of social mobility were "the red and the black," the army and the church. Modern capitalist and industrial society began to break open those molds. In business, there was the rise of the entrepreneur, the engineer, and the manager. With the succeeding breakdown of "family capitalism," the managerial elites were

no longer children of previous owners but men who earned their way up by technical competence. In government, there was the expansion of the administrative bureaucracy, in which top positions were achieved, as in France, through a rigorous selection system by rites of passage through the grandes écoles, or by patronage, as was usual in the United States.

Modern societies, in contrast with the past, have become more open societies, but at the same time, as knowledge and technical competence have become the requirement for elite positions, the selection process has fallen more and more onto the educational system as the sluice gates that determine who shall get ahead. The result has been increasing pressure on the educational system to provide "credentials" for those who want to move up the escalator of social mobility. In the postindustrial society, the technical elite is a knowledge elite. Such an elite has power within intellectual institutions—research organizations, hospital complexes, universities, and the like—but only influence in the larger world in which policy is made. Inasmuch as political questions become more and more intricately meshed with technical issues (from military technology to economic policy), the knowledge elites can define the problems, initiate new questions, and provide the technical bases for answers; but they do not have the power to say yes or no. That is a political power that belongs, inevitably, to the politician rather than to the scientist or economist. In this sense, the idea that the knowledge elite will become a new power elite seems to me to be exaggerated.

But what is equally true is that in contemporary society there is a growing egalitarianism fostered in large measure by sectors of the knowledge elite, especially the younger ones, and given the most vocal support by those in marginal positions and marginal occupations in the knowledge sector. Within institutions, this has taken the form of attacks on "authority" and "professionalism" as elitist and demands that all groups have some share in the decision-making power. In certain European universities, for example, even the nonprofessional staffs are given a voice and representation in university affairs, while on academic issues, from curriculum to tenure decisions, the three "estates" of students, junior faculty, and senior faculty have equal corporate rights. How far this egalitarianism will go remains to be seen.

The fear that a knowledge elite could become the technocratic rulers of the society is quite far-fetched and expresses more an ideological thrust by radical groups against the growing influence of technical personnel in decision making. Nor is it likely, at least in the foreseeable future, that the knowledge elites will become a cohesive "class" with common class interests, on the model of the bourgeoisie rising out of the ruins of feudalism to become the dominant class in industrial society. The knowledge class is too large and diffuse, and there seems little likelihood, either in economic or status terms, that a set of corporate interests could develop so as to fuse this stratum into a new class. What is more likely to happen, as I have argued previously, is that the different situses in which the knowledge elites are located will become the units of corporate action. One can identify functional situses, such as scientific, technological (applied skills like engineering, medicine, and economics), administrative and cultural, as well as institutional situses, such as economic enterprises, government bureaus, universities, research organizations, social service complexes (like hospitals), and the military. The competition for monies and influence will be between these various situses, just as in the communist world the major political units are not classes but situses such as the party, the government machine, the central planners, factory managers, collective farms, research institutes, cultural organizations, and the like.

What one sees in contemporary society is the multiplication of constituencies and consequently the multiplication of elites, and the problem of coordinating these elites and their coalitions becomes increasingly complex.

5. International organization The problems of creating a new infrastructure for telecommunications (or compunications) on a national scale are magnified when the questions are projected on the international scene. Just as within the last thirty years the United States has become a "national society," so in the next thirty years we will have an international society—not as a political order, but at least within the space-time framework of communications. Here not only is the scale enormously larger, but more importantly there is no common political framework for legislating and organizing the creation of a worldwide infrastructure.

International telephone traffic, for example, has been growing by about 20 percent a year, and international communications is handled by Intelstat, an international commercial satellite organization with ninety-odd member countries. Yet Intelstat has been largely dependent on one American aerospace company (Hughes Aircraft) to build the satellites and on the American space agency to launch its satellites into orbit. The day-to-day financial and technical management of Intelstat has been in the hands of an American corporation, Comsat, whose ownership is distributed half among ordinary shareholders and half by the large communications companies, among which AT&T has a prominent voice. The question of such dominance is bound to become more and more of an international political issue in the next decades.

On a different level, the creation of worldwide knowledge data bank and services becomes an important issue as more and more countries and their scientific, technical, and medical organizations seek to share in th

enlarged computerized systems and on-line networks that are being developed in the advanced industrial societies.

And finally—although this is only a sampling of the international issues that will play a role in the transformation of contemporary society—there is the question of the spread of computers, specifically the sharing of advanced computer knowledge and the creation of international computer data-transmission systems. In the period before World War I, steel production was the chief index of the strength of nations, and when Germany [illegible] Great Britain and France as a steel producer, it was a tangible sign of the growth of her economic and military power. A few years ago the Soviet Union overtook the United States in steel output, a fact that received only passing mention in the back pages of the *New York Times*. Yet the Soviet Union is far behind the United States in the production of computers and their degree of sophistication. The export of computers—to the Soviet Union and to China—are still political, not commercial questions, for one of the chief uses of computers has been for military planning, the design of military hardware, and most importantly the creation of guided missiles and "smart" bombs.

Turning Points and Promises

I have been arguing that information and theoretical knowledge are the strategic resources of the postindustrial society, just as the combination of energy, resources, and machine technology were the transforming agencies of industrial society. In addition—is the claim extravagant?—they represent turning points in modern history.

D. S. L. Cardwell has identified four major turning points in the rise of scientific technology.[30] One was the era of invention at the close of the late Middle Ages, signaled by the development of the clock and the printing press. The second, the scientific revolution, was symbolized by Galileo, with his emphasis on quantitative measurement and his technical analyses of the strength of materials and the structure of machines (for example, the square-cube law on the nature of size and growth). The third, the industrial revolution of Newcomen and Watt, was the effort to realize a Baconian program for the social benefits of science. The fourth is represented in the work of Carnot and Faraday, not only because it produced new conceptions of thermodynamics and field theory but also because it provided the bridge to a more integral relationship between science and technology.

The new turning points are of two kinds. One lies in the changing character of science. The transmutation of materials made possible by knowledge of the underlying structure of the properties of matter and the reorganization of information into different patterns through the use of the new communication technologies, particularly the computer, are transforming the social organization of science. On the one hand they create Big Science and on the other enhanced communication through on-line networks, cooperative ventures in the discovery of new knowledge and the experimental testing of results. Science as a "collective good" has become the major productive force in society.

The second turning point is the freeing of technology from its "imperative" character to become almost entirely instrumental. It was—and remains—a fear of humanists that technology would more and more "determine" social organization because the standardization of production or the interdependence of skills or the nature of engineering design forces the acceptance of one, and only one, "best" way of doing things—a theme that itself was fostered by prophets of the industrial age like Frederick W. Taylor. But the nature of modern technology frees location from resource site and opens the way to alternative modes of achieving individuality and variety within a vastly increased output of goods. This is the promise—the fateful question is whether that promise will be realized.

EDITORS' POSTSCRIPT

McCarthy's critique of Bell's essay rests on the argument that the new technology is not the main cause of change in our society today, given our reliance primarily on pre– rather than post–World War II inventions. In addition, the course projected for technology may veer off in unexpected directions. If, for example, firms and individuals keep progressively more of their records in computers, then automated paper handling may indeed reverse the growth trend forecast for the "knowledge industries." Further comments and discussion on Bell's views can be found in Weizenbaum's essay.

NOTES

1
For an elaboration of this concept, see my book, The Coming of Post-Industrial Society (New York: Basic Books, 1973). A paperback edition with a new introduction appeared in 1976 (New York. Harper & Row, Colophon Books).

2
Cyril Stanley Smith, "Metallurgy as a Human Experience," *Metallurgical Transactions A*, 64, no. 4 (April 1975):604. Professor Smith adds, "As an undergraduate (a half century ago) I had to decide whether to enroll as a ferrous or a non-ferrous metallurgist; I heard little about ceramics and nothing whatever about polymers. The curriculum, though refined in detail, had pretty much the same aim as the eighteenth century courses in the mining academy in Freiberg and the Ecole de Mines in Paris." (Ibid., p. 604.)

3
Jacob Bronowski, "Humanism and the Growth of Knowledge," in *The Philosophy of Karl Popper*, ed. Paul A. Schlipp (LaSalle, Ill.: Open Court Publishing Company, 1974), p. 628.

4

Norbert Wiener, *I Am a Mathematician* (Cambridge, Mass.: MIT Press, 1970), p. 40. (The book was first published in 1956 by Doubleday, New York.)

5

Smith, "Metallurgy as a Human Experience," pp. 620–621.

6

Harold A. Innis, "Minerva's Owl," in *The Bias of Communication* (Toronto: University of Toronto Press, 1951), p. 3, given as the presidential address to the Royal Society of Canada in 1947.

7

For example,

> The use of clay favored a dominant role for the temples with an emphasis on priesthood and religion. Libraries were built up in Babylon and Nineveh to strengthen the power of monarchy. Papyrus and a simplified form of writing in the alphabet supported the growth of democratic organization, literature, and philosophy in Greece. Following Alexander empires returned with centers at Alexandria and elsewhere and libraries continued as sources of strength to monarchies. Rome extended the political organization of Greece in its emphasis on law and eventually on empire. Establishment of a new capital at Constantinople was followed by imperial organization on the oriental model particularly after official recognition of Christianity. Improvement of scripts and wider dissemination of knowledge enabled the Jews to survive by emphasis on the scriptures and the book. In turn Christianity exploited the advantages of parchment and the codex in the Bible. With access to paper the Mohammedans at Baghdad and later in Spain and Sicily provided a medium for the transmission of Greek science to the Western world. Greek science and paper with the encouragement of writing in the vernacular provided the wedge between the temporal and the spiritual power and destroyed the Holy Roman Empire. The decline of Constantinople meant a stimulus to Greek literature and philosophy as the decline of Mohammedanism had meant a stimulus to science. Printing brought renewed emphasis on the book and the rise of the Reformation. In turn new methods of communication weakened the worship of the book and opened the way for new ideologies. Monopolies or oligopolies of knowledge have been built up in relation to the demands of force chiefly on the defensive, but improved technology has strengthened the position of force on the offensive and compelled realignments favoring the vernacular. (Ibid., pp. 31–32.)

Marshall McLuhan, as is evident, was a disciple of Harold Innis (he wrote the introduction to the paperback edition of *The Bias of Communication*) and derived most of his major ideas from him. But McLuhan not only "hyped up" and vulgarized Innis's ideas, he also reversed the thrust of his argument, for Innis feared that the tendency of new media was to extend centralization and concentrate power while McLuhan, though propagating the notion of a "global village," argued that the newer media would encourage decentralization and participation.

8

Encyclopaedia Britannica, 1970 ed., s.v. "information theory."

9

Norbert Wiener, *Cybernetics* (New York: Wiley, 1948), p. 155.

10

Wassily Leontieff, "National Economic Planning: Methods and Problems," *Challenge*, July–August 1976, pp. 7–8.

Referring to the further consequences of this new capacity, Leontieff writes:

> Such systematic information proves to be most useful in assessing structural—in this particular instance technological—relationships between the input requirements on the one hand, and the levels of output of various industries on the other. In the case of households these relationships would be between total consumers' outlay and spending on each particular type of goods. Stocks of equipment, buildings and inventories, their accumulation, their maintenance and their occasional reduction are described and analyzed in their mutual dependence with the flows of all kinds of goods and services throughout the entire system. Detailed, as contrasted with aggregative, description and analysis of economic structures and relationships can indeed provide a suitable framework for a concrete, instead of a purely symbolic description of alternative methods of production, and the realistic delineation of alternative paths of technological change. (Ibid., p. 8.)

11

> Indeed information is merely the negative measure of uncertainty, so to speak. Let me say immediately that I am not going to propose a quantitative measure. In particular, the well-known Shannon measure which has been so useful in communications engineering is not in general appropriate for economic analysis, for it gives no weight to the value of the information. If beforehand a large manufacturer regards it as equally likely whether the price of his product will go up or down, then learning which is true conveys no more information, in the Shannon sense, than observing of the toss of a fair coin. (Kenneth J. Arrow, *Information and Economic Behavior*, ed. Federation of Swedish Industries [Stockholm: Federation of Swedish Industries, 1973].)

12

As Arrow remarks,

> The presumption that free markets will lead to an efficient allocation of resources is not valid in this case. If nothing else, there are at least two salient characteristics of information which prevent it from being fully identified as one of the commodities represented in our abstract models of general equilibrium: (1) it is by definition indivisible in its use, and (2) it is very difficult to appropriate. (Ibid., p. 11.)

13

Robert K. Merton, "Singletons and Multiples in Science," in *The Sociology of Science*, the papers of Merton, ed. Norman W. Storer (Chicago: University of Chicago Press, 1973, pp. 343–370).

14

The problem is that economists have no direct measures of such "inputs" and treat them as "residuals," not accounted for by direct increases in the productivity of capital or labor. As Michael Spence writes,

> The difficulty in measuring information has hampered research concerned with the effects of information on [economic] growth. It is common practice to estimate the effect of education and knowledge on growth in GNP by first estimating the impact of real factors like the increase in capital stock, the labor force, and so on. One then attributes the growth that is not explained in these real factors to increases in knowledge.

15

There is a huge and growing literature on all these questions. I have drawn largely on the reports of the Harvard Program on Information Technology and Public Policy for the material in this section.

16

See *The Production and Distribution of Knowledge in the United States* (Princeton: Princeton University Press, 1962). For a detailed discussion of Machlup's types of knowledge in comparison with those of Max Scheler and my own, see Bell, *The Coming of Post-Industrial Society*, pp. 174–177. Since, for me, the heart of the postindustrial society is the new ways in which knowledge becomes instrumental for science and social policy, I have attempted an "objective definition" that would allow a researcher to plot the growth and use of knowledge.

17

Marc Porat has reformulated the 1967 National Income Accounts to make them consistent with accepted practices, and despite some admitted deficiencies, he has hewed to the standard usages. As Porat points out,

Machlup's accounting scheme innovated rather liberally on the National Income Accounts and Practices whereas this study does not. . . . His work includes an admixture of "primary" and "secondary" type activities, whereas this study keeps them distinct. Third, a variant of *final demand* is used by Machlup as a measure of knowledge industry size, whereas this study uses primarily the value added approach but reports both sets of figures. . . .

"The Information Economy" (Ph.D. diss., Stanford University, 1976), 1:81–82.

18
Machlup's key data can be presented in tabular form:

Distribution of Proportion of Gross National Product Spent on Knowledge, 1958

Type of Knowledge and Source of Expenditures	Amount in Millions of Dollars	Percentage of Total
Education	60,194	44.1
Research and development	10,090	8.1
Communication media	38,369	28.1
Information machines	8,922	6.5
Information services (incomplete)	17,961	13.2
Totals	136,436	100.0
Expenditures made by:		
Government	37,968	27.8
Business	42,198	30.9
Consumers	56,270	41.3
Totals	136,436	100.0

Source: Fritz Machlup, *The Production and Distribution of Knowledge in the United States* (Princeton: Princeton University Press, 1962), pp. 360–361. Arranged in tabular form by permission.

19
Gilbert Burck, "Knowledge, the Biggest Growth Industry of Them All," *Fortune*, November 1964.

20
Jacob Marschak, "Economics of Inquiring, Communicating, Deciding," *American Economic Review* 58, no. 2 (1968), 1–8.

21
The statistics and tables here, except where noted, are taken from Porat, "The Information Economy," vol. 1. The page citations refer to that volume. The figures on trends in the work force are from a briefing packet that Mr. Porat had prepared for presentation at an OECD conference. I am grateful to him for making these materials available to me, and for his correspondence in clarifying some of my questions. His revised work is scheduled to be published by Basic Books.

22
I am indebted for this technological information to a research paper by Paul DiMaggio, a graduate student of sociology at Harvard.

23
Georges Anderla, *Information in 1985, A Forecasting Study of Information Needs and Resources* (Paris: OECD, 1973), pp. 15–16.

24
Little Science, Big Science (New York: Columbia University Press), p. 31. For a critical discussion of the use of logistic curves and some questions about Price's various starting points, see my *The Coming of Post-Industrial Society*, chap. 2, "The Measurement of Knowledge and Technology," pp. 177–185.

25
Anderla, *Information in 1985*, p. 21. The major specialist journals were: *Chemical Abstracts* and *Biological Abstracts* (which between them accounted for more than 550,000 items, more than half of the one million produced in 1971), *Engineering Index Monthly, Metals Abstracts, Physics Abstracts, Psychological Abstracts*, and a Geology Index Service.

26
The figures are taken from a paper by Lee Burchinal of the National Science Foundation, "National Scientific and Technical Information Systems," presented to an international conference in Tunis, April 26, 1976. I am grateful to Dr. Burchinal for the preprint.

27
Cited by Colin Cherry, "The Spreading Word of Science," *Times Literary Supplement*, March 22, 1974, p. 301.

28
Remarks made at the Science Information Policy Workshop, National Science Foundation, Washington, D.C., December 17, 1974.

29
One major difficulty is the inadequacy of our statistics. As Peter H. Schuck remarks.

What is perhaps more disturbing, given the imminence of national economic planning, is the abject poverty of our economic statistical base, upon which a good theory must be grounded. In recent years the inadequacy and inaccuracy of a broad spectrum of economic indices—including the wholesale price index, the consumer price index, the unemployment rate, and business inventory levels—have become quite evident. The wholesale price index, for example, reflects only list prices rather than actual transaction prices (which are often lower) and uses anachronistic seasonal adjustment factors; yet it is considered a bellwether statistic in economic forecasting. ("National Economic Planning: A Slogan without Substance," *The Public Interest*, Fall 1976, p. 72.)

30
D. S. L. Cardwell, *Turning Points in Western Technology* (New York: Science History Publications, 1972).